

	Presenter:
	Organization/Date: Orbiter/02-14-02

# BACKUP INFORMATION

	Presenter:
	Organization/Date: Orbiter/02-14-02

**STS-108  
IN-FLIGHT ANOMALIES  
BACKUP**

<b>STS-108-V-01 and 02: RCS THRUSTERS R4U AND F3F FAILED OFF</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**Observation:**

- Thruster R4U failed off during mated coast
- Thruster F3F failed off during ISS docking

**Concern:**

- Loss of RCS thruster redundancy

**Discussion:**

- R4U failed off during first commanded firing
  - Chamber pressure (Pc) reached max value of 15.8 psia
  - RM deselected thruster due to failure of Pc to reach 26 psia within 320 ms
- F3F failed off during first commanded firings
  - Pc reached max value of 6.4 psia
  - RM deselected thruster after three successive 80 ms low Pc pulses

<b>STS-108-V-01 and 02: RCS THRUSTERS R4U AND F3F FAILED OFF</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

### Discussion:

- Fuel and oxidizer flow was evident by drop in injector temps during both failures
- Low Pc and injector temp drop indicate partial flow on one valve and full flow on other valve
- Two most likely causes are ox valve nitrate contamination and fuel valve extrusion
- 6th flight for both thrusters since last installation/flushing

### Actions Taken/Planned:

- Thrusters were deselected for remainder of mission
- Thrusters will be removed and sent to WSTF for TT&E
  - Requires entire manifold R&R to prevent sympathetic failures

<b>STS-108-V-01 and 02: RCS THRUSTERS R4U AND F3F FAILED OFF</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Risk Assessment:

- Failed off thruster is Crit 1R/3
  - Redundant thrusters exist in all firing directions
  - Extensive flight history of failed off thrusters
    - Well documented and understood failure mode
- Risk mitigation actions taken
  - Preventative maintenance thruster flushing performed at OMDP
  - Full manifold R&R required for any thruster removal to preclude collateral damage
  - GN2 chamber purge implemented during turnaround operations to reduce propellant vapor build-up
  - Molecular sieve of oxidizer implemented at KSC

<b>STS-108-V-01 and 02: RCS THRUSTERS R4U AND F3F FAILED OFF</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

### Acceptable for STS-109 Flight:

- Thrusters passed all bench checks prior to installation
- Risk mitigation actions taken to reduce failures
  - All OV-102 thrusters recently flushed at WSTF
  - GN2 purge used during ground ops
  - Molecular sieve of oxidizer utilized
- Flight rules exist for failed off thrusters
- Redundant thrusters for each firing direction
- Not a safety of flight issue

**STS-108 IMU-2 Z-AXIS/REDUNDANT  
RATE ANOMALY**

Presenter:

Organization/Date:  
Orbiter/02-14-02**Observation:**

- During STS-108 mission, IMU 2 annunciated Redundant Rate and Platform Fail BITES (GMT 347:05:39)

**Concern:**

- Although the observed anomaly is transient in nature, a hard failure of IMU 2 would result in loss of one level of redundancy

**Discussion:**

- Data review indicates that reported anomaly was the result of degraded performance associated with Z / Redundant axes of Azimuth gyro
  - Redundant rate measured  $>3.0$  deg/hr (0.006 deg/hr = 1-sigma)
- The anomaly persisted for approximately 45 minutes, after which time IMU 2 resumed normal operation, and the BITES cleared
- The crew commanded IMU 1 from Standby (due to Group B power-down) to Operate mode, deselected IMU 2, and masked the alarm

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**STS-108 IMU-2 Z-AXIS/REDUNDANT  
RATE ANOMALY**

Presenter:

Organization/Date:  
Orbiter/02-14-02**Discussion: (Cont)**

- Data indicates that the signature is not consistent with a gyro bearing lubricant issue
  - A gyro bearing problem is characterized by a gradual, yet progressive, performance degradation (i.e., it does not cure itself)
- Review of HAINS IMU failure history has identified one other instance of a redundant rate anomaly
  - During STS-65 mission (OV-102), redundant rate parameter exhibited a 0.7 deg/hour drift rate in HAINS S/N 204 (Ref. CAR 65RF04)
    - Despite the intermittent nature of the observed redundant rate anomaly, HAINS S/N 204 was inserted in the redundant set and successfully supported entry
  - Subsequent TT&E identified a generic defect in the press-fit ground connections of the HAINS DC/DC circuit cards
    - In 1995, a fleet-wide retrofit replaced all press-fit grounds with a simple, yet more reliable, design (employs a terminal lug, bolt, lock washer and nut to achieve the desired ground connection)

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<b>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Discussion (Cont)

- The OV-102 HAINS IMUs have a very good pedigree
  - Only 8 operational anomalies since the IMUs were introduced in the Orbiter fleet (11/91)
- Post-Landing Actions
  - IMU 2 (HAINS S/N 207) was removed from OV-105
  - HAINS S/N 207 was sent to JSC/ISL for initial testing
    - Anomaly has not been observed (as of 01/25/02)
    - Testing at ISL is attempting to observe anomaly by duplicating gimballed attitudes during time that anomaly was observed
    - Readout of internal EEPROM indicates that Gyro Wheel Supply BITEs occurred and caused Platform Fail BITEs
      - Indicates that during anomaly, the gyro wheel was not operating at correct speed – possibly due to open connection in speed control loop
- Future plan is to send S/N 207 to vendor for more extensive testing including internal measurements and environmental tests intended to precipitate anomaly

**STS-108 IMU-2 Z-AXIS/REDUNDANT  
RATE ANOMALY**

Presenter:

Organization/Date:  
Orbiter/02-14-02**Risk Assessment:**

- Criticality of the IMU is 1R3 for loss of output, 1R2 for erroneous output
- Flight rules permit continuation to NEOM following the loss of one IMU
- A second IMU failure would result in a next PLS if system loses all fault tolerance or failure is considered generic

<b>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

### Acceptable for STS-109 Flight:

- The OV-102 IMUs have passed initial OMRSD testing
- These LRUs will receive V1043 and Pre-Flight Calibration testing prior to launch
- The OV-102 IMUs have successfully supported 22 Orbiter missions
- The IMU has adequate system redundancy

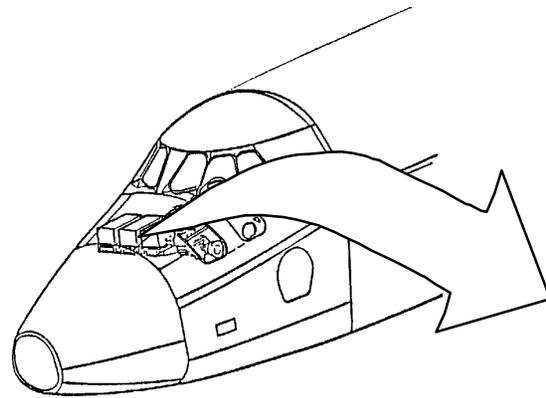
<b>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</b>	<b>Presenter:</b>
	<b>Organization/Date:</b> Orbiter/02-14-02

**Discussion: (Cont)**

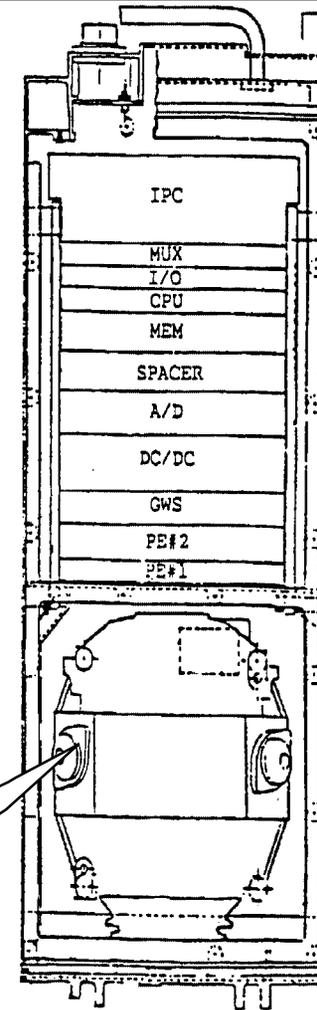
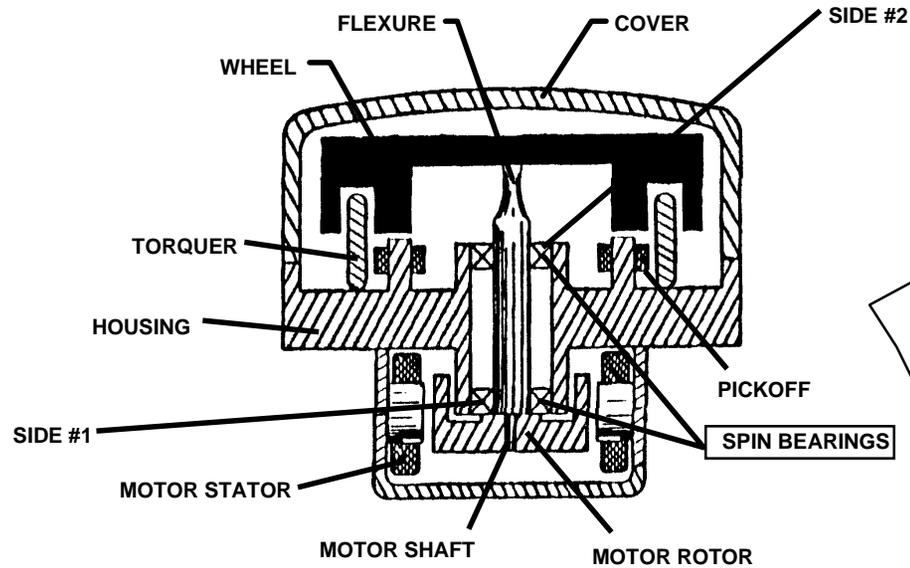
**OV-102 IMU Pedigree**

Slot #	S/N	Operate Hours (approx.)	Prior Flights	Gyro Vertical	Gyro Azimuth	Operational Failure History
1	205	4261	13	Old	Old	AE0439 (5/95): Cracked solder joint on DC/DC card
2	209	2842	5	Old	Old	AD7809 (11/90): KSXE 126.8 ppm, s/b +/- 121.0 (W09100) AE1671 (1/99): DP -52.4 s/b 45.0 arc-sec (3-sigma)
3	211	3468	4	Old	Old	AE0280 (10/92): Excessive 17 hr bias drift instability (UA) AE0281 (10/92): KOX, KOYH & KSY exceed req's (UA) AE0345 (02/95): KOY ground→orbit delta exceeded 3 sigma AE1190 (09/97): X-Accel channel failure AE1411 (05/98): X-Accel bias & symmetry

<b>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02



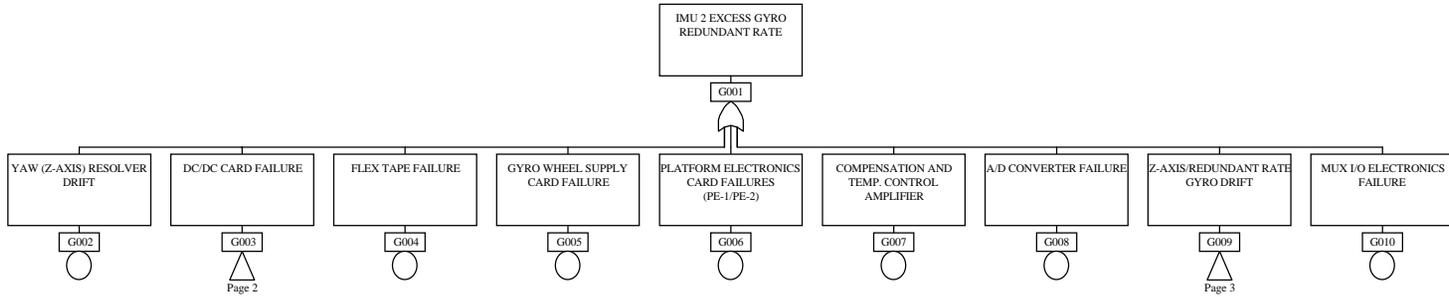
**GYROFLEX GYRO**



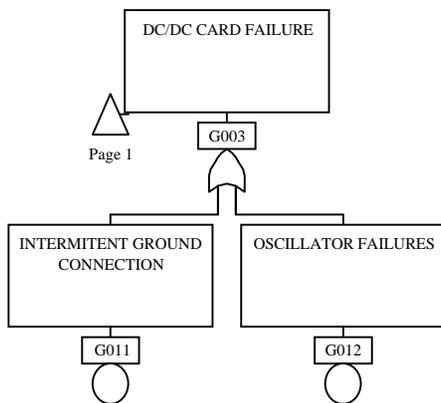
**HAINS CHASSIS - TOP VIEW**

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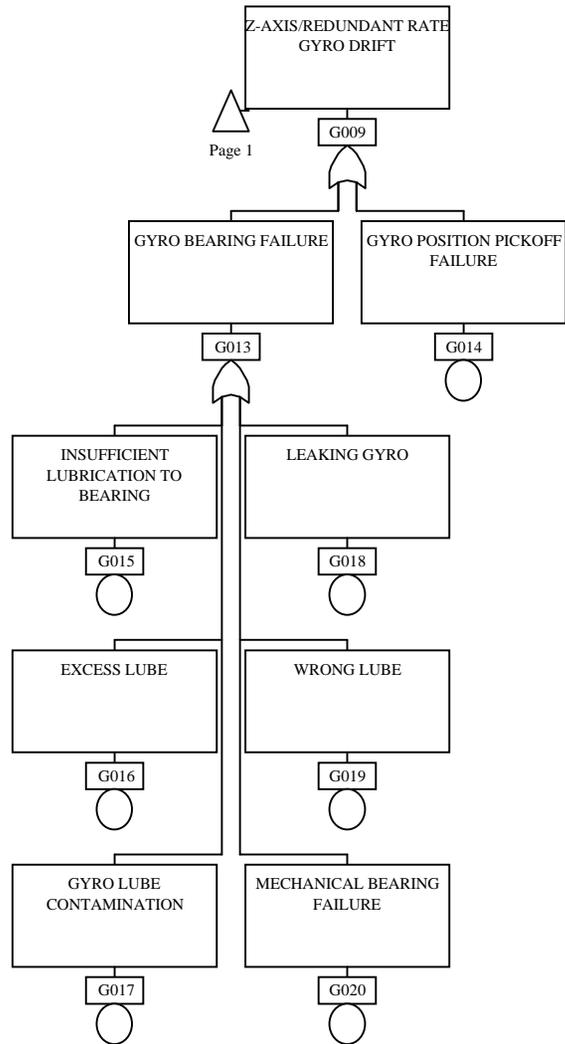
<b>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</b>	<b>Presenter:</b>
	<b>Organization/Date:</b> Orbiter/02-14-02



<b>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</b>	<b>Presenter:</b>
	<b>Organization/Date:</b> Orbiter/02-14-02



<h1>STS-108 IMU-2 Z-AXIS/REDUNDANT RATE ANOMALY</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02



Page 1

<b>STS-108 FES CONTROLLER ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**Observation:**

- The FES failed to control the outlet temperature during on-orbit check-out of the FES secondary controller

**Concern:**

- Loss of redundant FES control, and redundant cooling to the orbiter

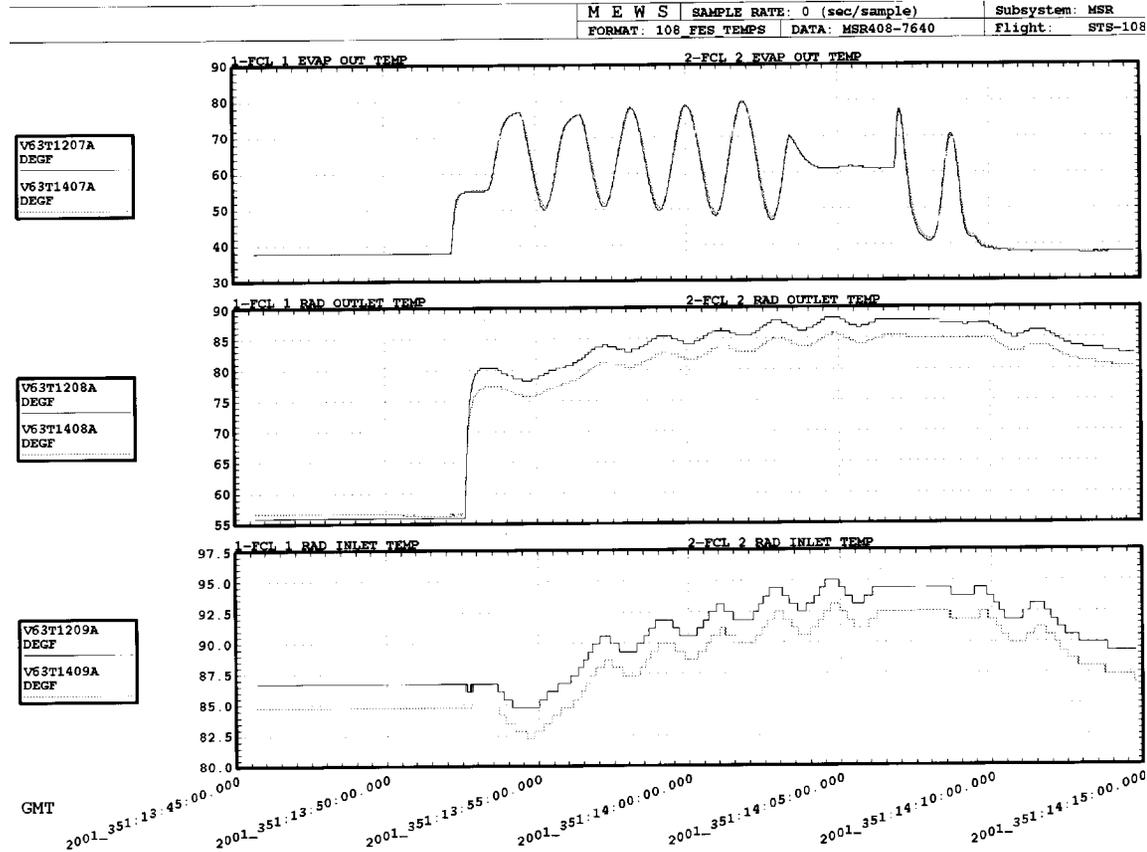
**Discussion:**

- During STS-108 on-orbit FES check-out (MET 011:15:35) after the radiator cold soak, with the hi-load evaporator enabled using the A supply valve, the FES outlet temperature oscillated between 45°F and 80°F when the secondary controller was activated
  - FES outlet temperature was unstable (normally takes 2 minutes to stabilize)
  - Outlet temperature stabilized at 62°F when the topping evaporator was selected

# STS-108 FES CONTROLLER ANOMALY

Presenter:

Organization/Date:  
Orbiter/02-14-02



<b>STS-108 FES CONTROLLER ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Discussion: (Cont)

- This was the first occurrence in the Program of this type of anomaly
- FES checkout continued in the full-up mode with the primary B controller, and the FES performed nominally to EOM
- Two redundant primary controllers (A and B) control outlet temperature to  $39 \pm 1^{\circ}\text{F}$
- One secondary controller controls to  $62 \pm 2^{\circ}\text{F}$  with three modes (hi-load A water supply, hi-load B water supply or topper)
- Normal orbiter operation only requires primary controller function
- Secondary controller only used for contingency operations
  - Loss of primary controllers
  - Flush technique for FES shut down

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<b>STS-108 FES CONTROLLER ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Discussion: (Cont)

- Post-flight troubleshooting of OV-105 FES isolated the secondary mid-point temperature sensor as the cause of the STS-108 anomaly
  - Controller functional test performed with nominal results
  - Steady state reading of the sensor was within 0.25°F of the two primary sensors
  - However, transient (ramp) test showed a 2-second lag
    - Previous experience indicates loss of thermal conductivity of packing
  - Sensor R&R is planned for February 12th, to be completed by end of week
- Newly refurbished FES is installed in OV-102 at OMM
  - Successfully passed ATP testing
    - All controllers & control modes verified in ATP
  - OMRSD test complete with no open issues

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<b>STS-108 FES CONTROLLER ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Risk Assessment:

- Secondary controller is criticality 1R3 for complete failure to operate
  - Primary A and primary B controllers provide the first and second level of redundancy
- Minimum risk to STS-109
  - Secondary controller is not required for normal orbiter operations
  - Observed failure on STS-108 maintained topper operation capability on secondary controller
  - Contingency operations still possible with unstable outlet temperature

<b>STS-108 FES CONTROLLER ANOMALY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

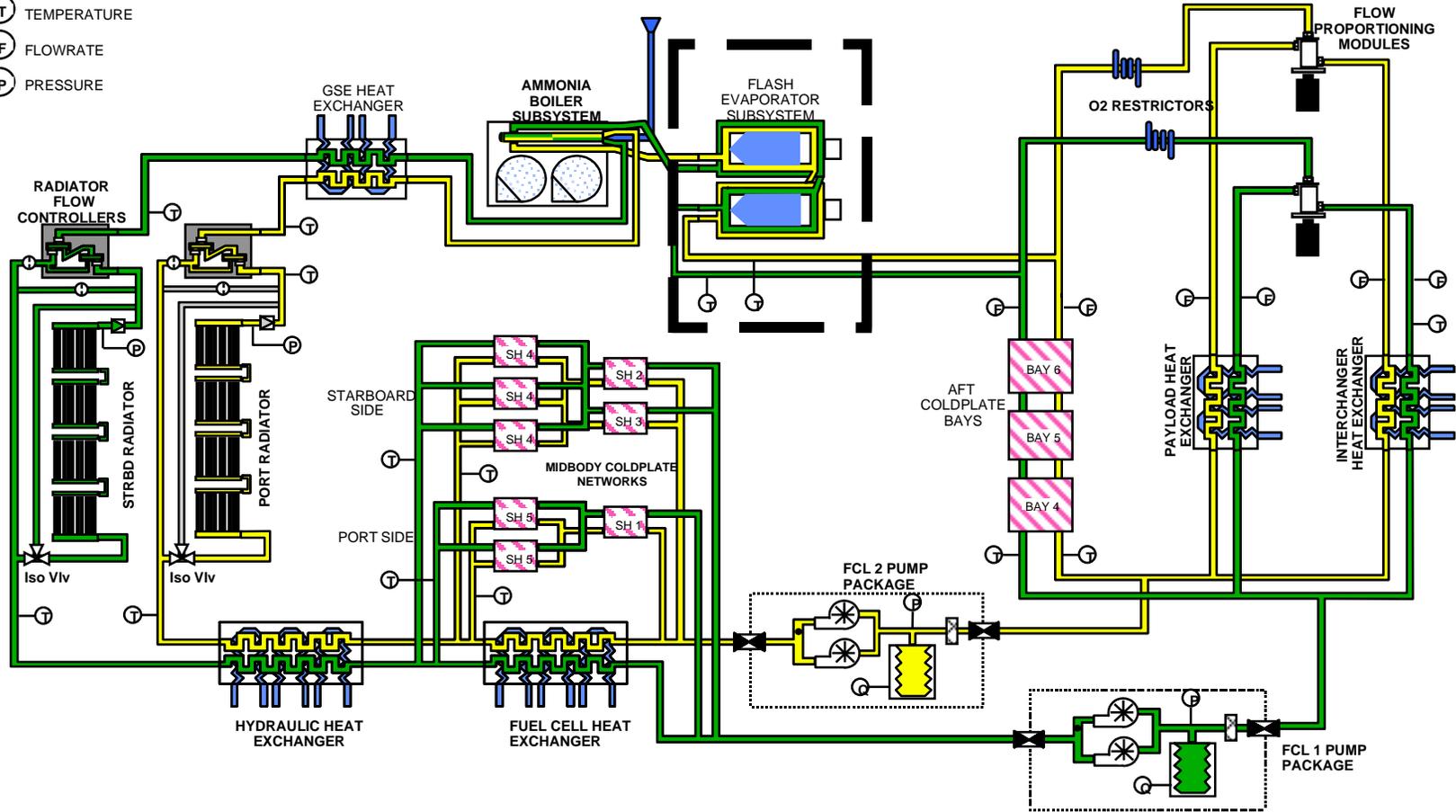
### Acceptable For STS-109 Flight:

- OV-102 FES is newly refurbished and has successfully completed all test requirements
- Secondary controller operation represents the third level of electrical redundancy
  - STS-108 anomaly did not affect topper mode operation
  - Safe return could still be achieved with loss of primary A and primary B controllers

<h1>STS-108 FES CONTROLLER ANOMALY</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02

- Q QUANTITY
- T TEMPERATURE
- F FLOWRATE
- P PRESSURE

## ORBITER ACTIVE THERMAL CONTROL SYSTEM (ATCS)

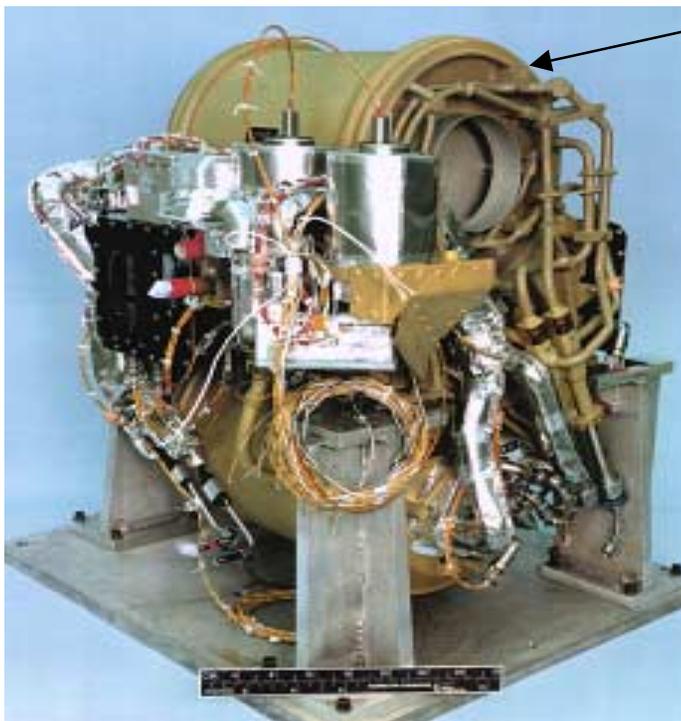


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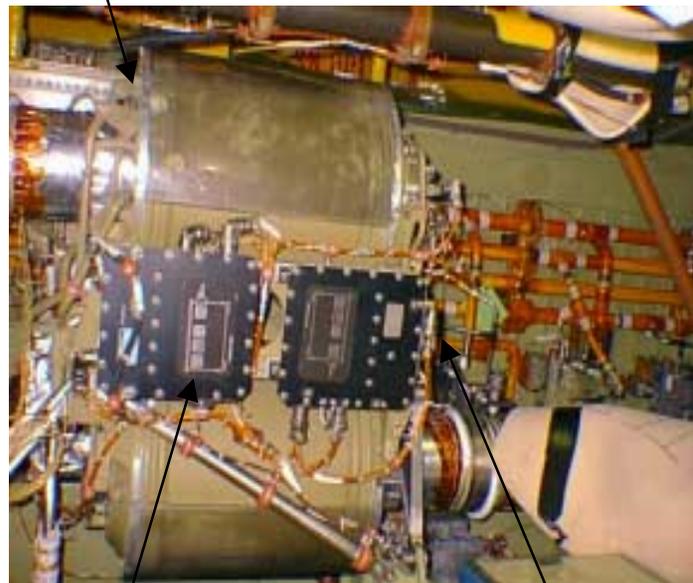
# STS-108 FES CONTROLLER ANOMALY

Presenter:

Organization/Date:  
Orbiter/02-14-02



Hi-load core



Secondary Controller

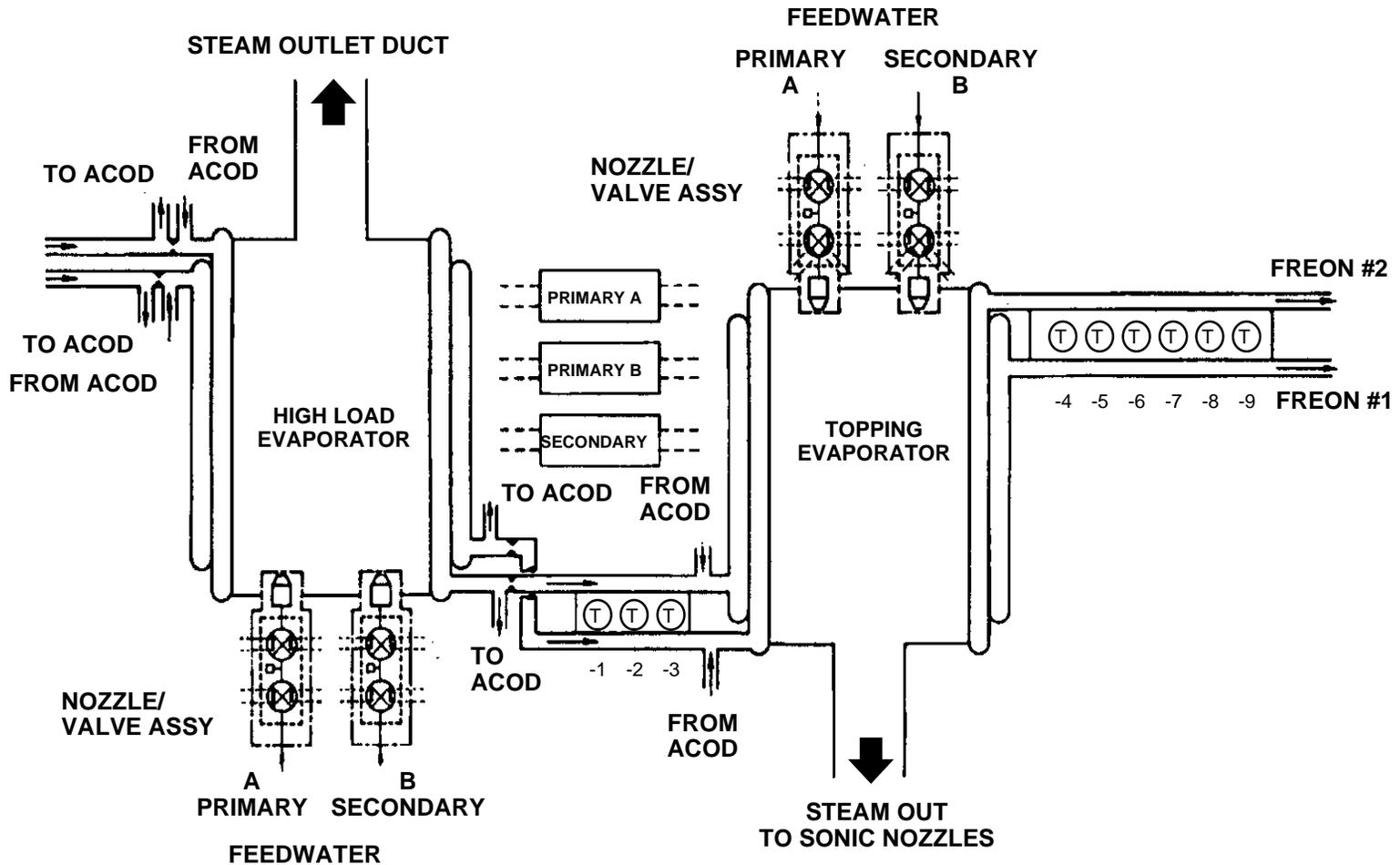
Mid Point Temp Sensor

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# FES FLUID SCHEMATIC

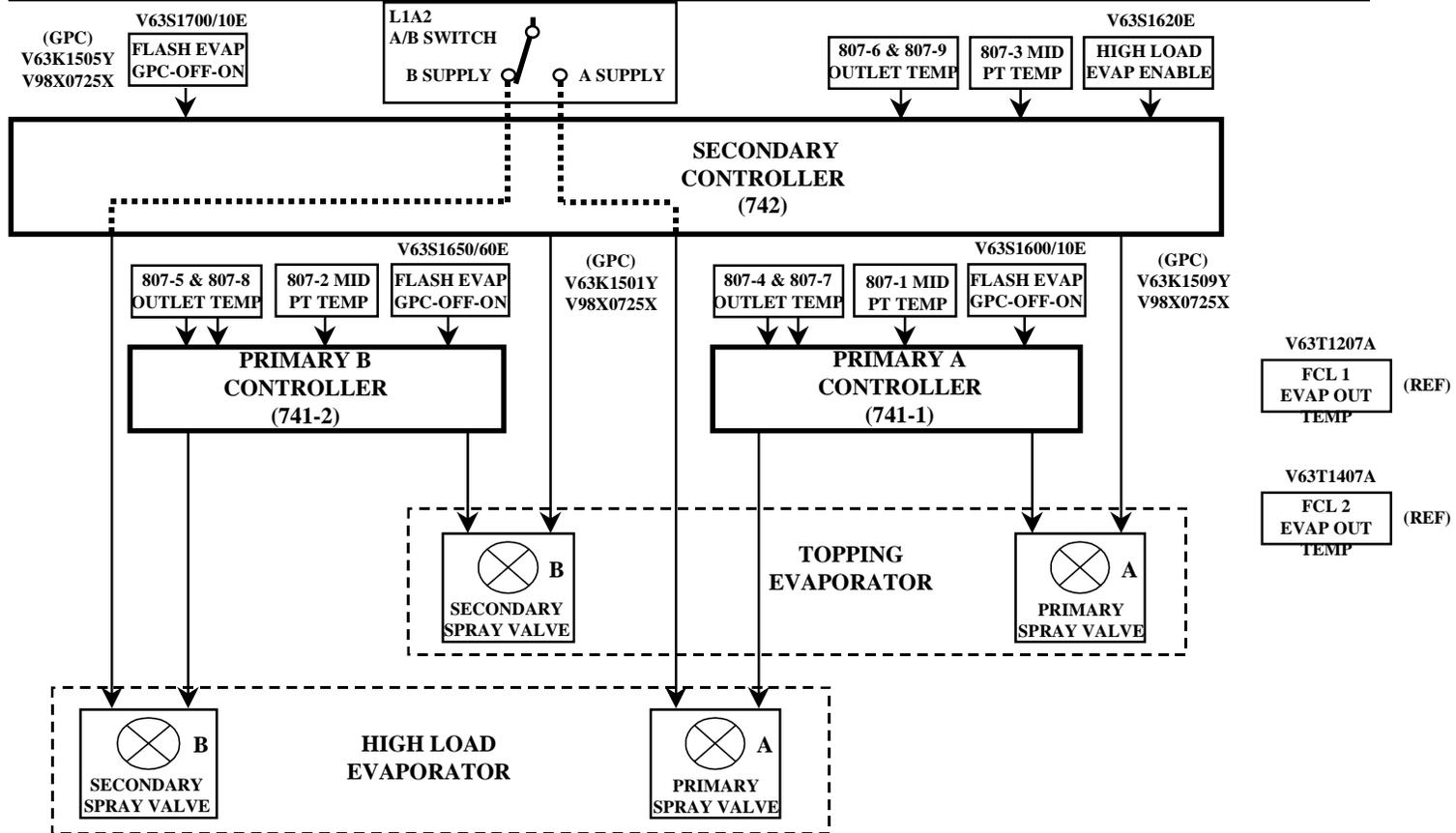
Presenter:

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Orbiter/02-14-02



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<h1>FLASH EVAPORATOR CONTROLLER</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02



**FES Controllers Use Mid-Point Temperature, Outlet Temperature, Switch Information For A/B Feedwater, High Load Enable, And GPC Mode In Their Control Logic**

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**Observation:**

- STS-93 AC1 short was isolated to a mechanically induced exposed conductor located above a rough screw head in the lower port midbody wire tray between bays 11 and 12
- The exposed conductor had shorted to the screw head

**Concern:**

- Other undetected exposed conductors could exist, and additional shorts may occur

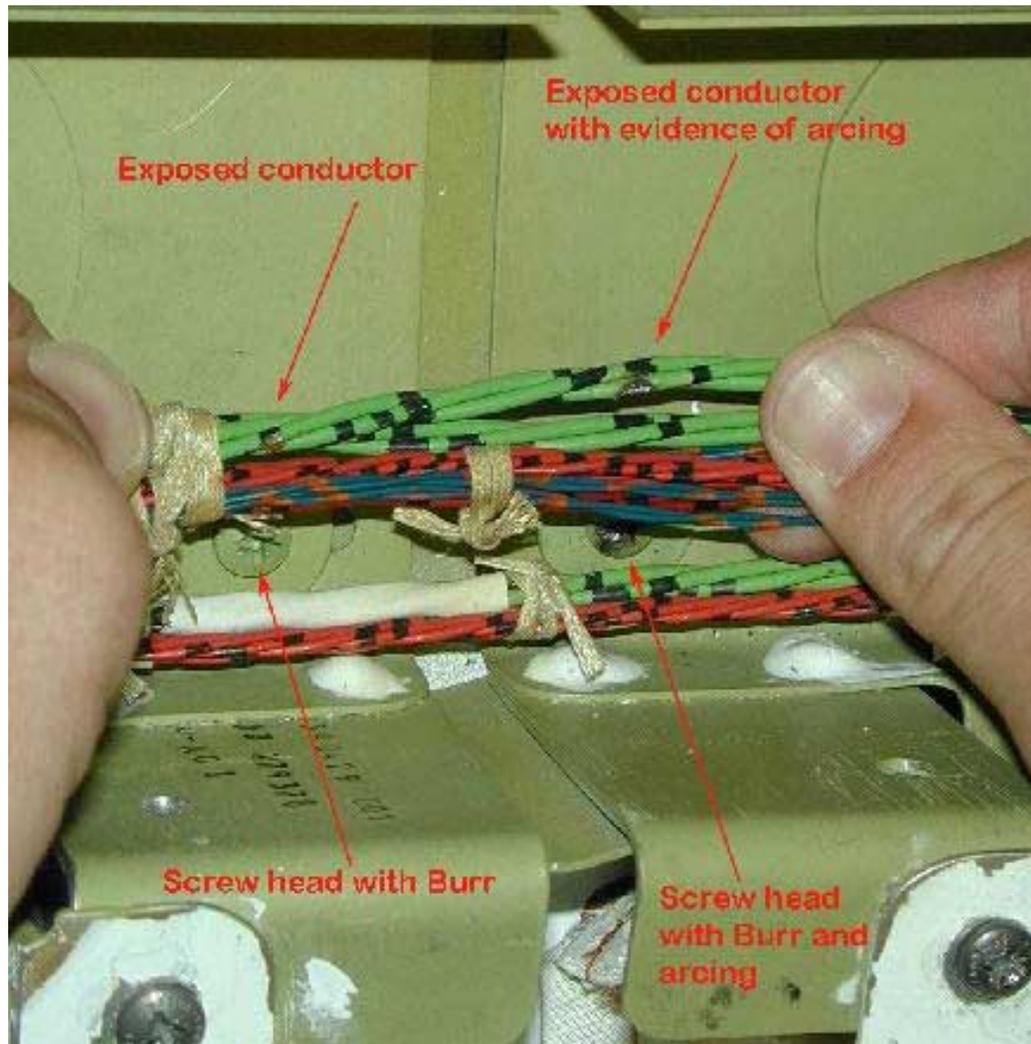
**Actions Taken:**

- OV-102 wiring was thoroughly inspected and repaired during the most recent OMM at Palmdale

**PREVIOUS SPACE SHUTTLE  
MISSION OV-102 STS-93  
IN-FLIGHT ANOMALIES**

Presenter:

Organization/Date:  
Orbiter/02-14-02



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<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## **OV-102 Wire Inspection Purpose Was Two-Fold**

- To locate, assess, and repair damaged wiring
- To validate the criteria used to perform the inspection and repair on the rest of the fleet

## **Both Objectives Were Accomplished**

- OV-102 inspection and repair is complete and damage has been assessed
- No new types of damage were discovered
  - Root cause remains mechanically induced damage
- Fleet-wide inspection and repair criteria was validated

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## OV-102 OMM Wire Inspection Assessment

- Access to OV-102 wire harnesses for inspection was significantly greater than for any other vehicle in the fleet
  - Many LRUs removed to perform modifications
  - Majority of all convoluted tubing was removed for inspection under the tubing
  - 95% of all wire harnesses inspected
- Two major types of wire harness inspections performed at Palmdale
  - Category 1 — wire harnesses opened for modifications or to determine the extent of observed damage were fanned and each wire was inspected (~30%)
  - Category 2 — all other wire harnesses were completely inspected on the perimeter

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 OMM Wire Inspection Assessment**

- Final OV-102 Wire Inspection Assessment (February 2001) vs. Other Vehicles (August 2000)

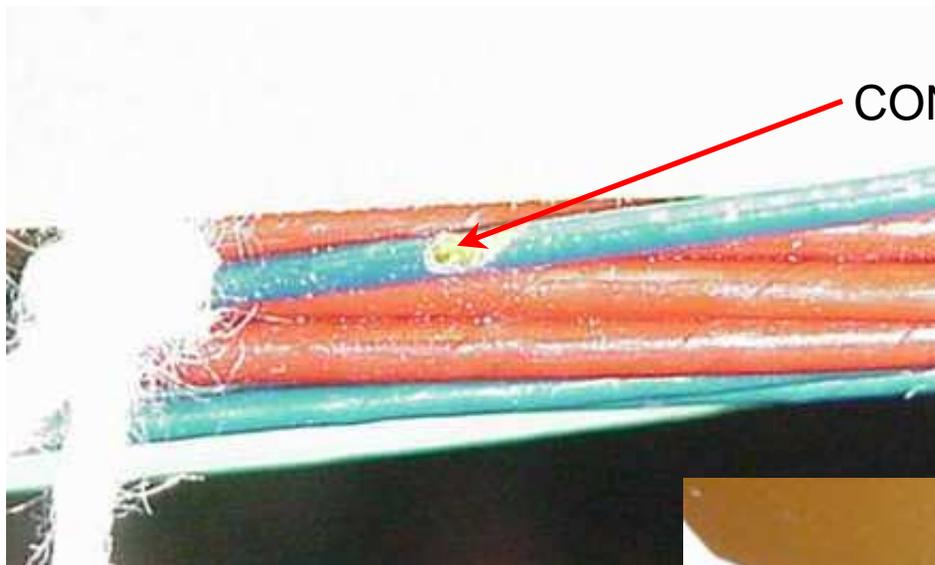
	OV-102	OV-103	OV-104	OV-105
<b>Kapton/Other Damage</b>				
Forward	466	31	38	24
Mid	563	136	343	144
Aft	448	227	398	89
<b>Exposed/Damaged Conductors</b>				
Forward	81	4	7	1
Mid	144	26	43	45
Aft	188	60	55	27
<b>Vehicle Totals</b>				
	1890	450	792	312

- Numerical differences reflect differences in inspection access between vehicles and differences in vehicle age and modification history

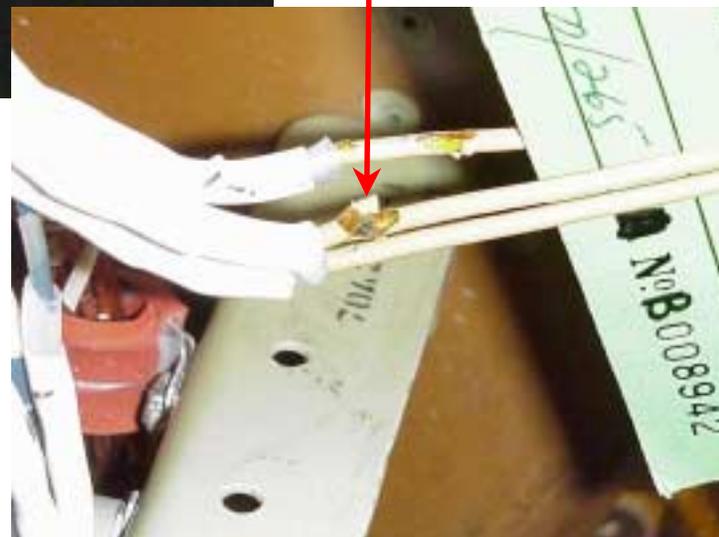
**PREVIOUS SPACE SHUTTLE  
MISSION OV-102 STS-93  
IN-FLIGHT ANOMALIES**

Presenter:

Organization/Date:  
Orbiter/02-14-02



CONDUCTOR DAMAGE



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<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## OV-102 OMM Wire Inspection Observations and Conclusions

- Root cause of mechanically induced damage remains the same
  - No new failure mechanisms found
- Expect to find similar numbers of PRs for all vehicles during their OMM inspections
  - Larger number of PRs on OV-102 reflect differences in inspection access between vehicles and differences in vehicle age and modification history
- No exposed conductors found in proximity to any other exposed conductors
- No unique groupings found in forward or mid that would indicate a common cause for mechanically-induced damage

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## **OV-102 OMM Wire Inspection Observations and Conclusions**

- Damage pattern in the aft confirms that more damage is induced in higher-traffic areas
  - Higher number of PRs found in higher traffic areas
- Significant damage groupings in the aft were inspected and repaired on other vehicles
  - Exposed conductors between the ends of convoluted tubing and clamps or connectors
  - Exposed conductors in the backshells of the monoball connectors
  - Exposed conductors near connector backshells

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## OV-102 Post-OMM Wire Inspection and Repair Observations and Conclusions

- The seemingly large number of wire PRs and IPRs picked up during the flow at KSC (>400) caused us to assess this flow relative to other post-OMDP flows
  - Number of PRs is high, but not out-of family
    - Average number for a post-OMDP flow is 300
  - Distribution of damage types is not unusual
- |       |  |     |                              |
|-------|--|-----|------------------------------|
| • 62  | Kapton Damage                                | 2   | Taut wire                    |
| • 2   | Damaged Conductor                            | 32  | Chafe                        |
| • 22  | Exposed Conductor                            | 117 | Other                        |
| • 3   | Wire pinched in clamp                        | 4   | Wire kinked/bent             |
| • 3   | Outer jacket and shield damage               | 29  | Broken wire or lug           |
| • 103 | Radial Crack exposing shield                 | 2   | Recessed pin/socket          |
| • 9   | Connector/Backshell damage                   | 12  | Wire/harness loose/unsecured |
| • 13  | Loose backshell/wire improperly capped       |     |                              |
| • 1   | Jacket damage with primary conductor exposed |     |                              |

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## **OV-102 Post-OMM Wire Inspection and Repair Observations and Conclusions**

- Retest adequacy was evaluated
- Approximately 12-16 thousand requirements are accomplished in an OMM flow
  - Most of these requirements are tests, not inspections
- This is the third OMM to use SCAN tracking/retest at Palmdale
- Risk of missing a problem with wire repair is estimated no greater than a standard flow because of increased flow testing coupled with SCAN tracking/retest at Palmdale

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## **On-Going, Fleet-Wide Orbiter Wiring Improvement Plan Comprises Three Interlocking Areas**

- Requirements
- Inspection
- Modifications

### **Requirements**

- Inspection requirements baselined in OMRSD
- Inspection, repair, and protection requirements baselined in wire specification

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Inspection

- All inspection, repair, and protection (past and future) done per revised wire specification
- Personnel are trained and certified
  - Wire inspectors
  - All persons entering the Orbiter are trained for wire awareness
- Access and opportunities for “OMM-level” inspections available during
  - Wire improvement modifications
  - Other modifications such as cargo PC and new MMU
  - LRU R&R

STS-109 FLIGHT READINESS REVIEW

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter: Doug White
	Organization/Date: Orbiter/02-14-02

Modification	102	103	104	105
Aft sidewall protection	✓ 2/01	✓ 1/01	✓ 12/00	✓ 10/00
Landing gear down crit 1/1 elimination	✓ 2/01	✓ 1/01	✓ 12/00	✓ 10/00
Pyro harness heat - shrink	✓(fwd/aft) mid STS-118	✓(fwd/aft) mid OMM	✓(fwd/aft) mid STS-114	✓(fwd/aft) mid STS-117
Convolutd tubing through the clamps	✓ 2/01	OMM	✓ 6/01	✓ 3/01
129 redundancy separations	✓ (5) STS-118 OMM	OMM	✓ (53) OMM	✓ (52) OMM
Monoball production break	STS-118	OMM	110 2/02	✓ 10/01

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<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter: Doug White
	Organization/Date: Orbiter/02-14-02

Modification	102	103	104	105
Redundancy separation/ protection for 12 flight deck AC circuits	STS-118 OMM	OMM	✓ (9) 2/02 OMM	✓ (9) 10/01 OMM
Redesign midbody crossover bracket	STS-118	OMM	STS-114	STS-111
Remove midbody wire tray risers	OMM	OMM J4	OMM	OMM
Crit 1R2 circuit redundancy improvement	Protection plan presented at VECB. SSVEO decided insufficient risk reduction achieved vs cost and did not recommend implementation			
APU heater crit 1/1 elimination	Presented to VECB. SSVEO approved implementation of protective covers during turnaround			

<b>PREVIOUS SPACE SHUTTLE MISSION OV-102 STS-93 IN-FLIGHT ANOMALIES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

### Acceptable for STS-109 Flight:

- Root cause of mechanically induced damage remains the same
  - No new failure mechanisms found on OV-102 during OMM inspection
- Areas of significant damage on OV-102 were inspected and repaired
- If undetected damage exists, consequences of damage are mitigated by Orbiter design

	Presenter:
	Organization/Date: Orbiter/02-14-02

# CONFIGURATION CHANGES AND CERTIFICATION BACKUP

<h1>CONFIGURATION CHANGES AND CERTIFICATION STATUS</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Mission Requirements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 17177 VPU Circuit Breaker Decal				N/A		• Re-labeled CB70 on panel R14 from CCTV to VPU
MCR 17334 Orbiter Bay 11 Mid-Body Blanket Mod				N/A		• Modified blankets to accommodate EDO cryo feed-through boxes
MCR 18755 Modified GFE Winch			X	09-25-650007-001M	7/5/01 A	• Installed modified forward and aft GFE winches which incorporate new 4 ball PIP pins and safety wiring
MCR 19047 Forward Bulkhead Thermal Control System Mod		X	X	19-09-260002AI	2/6/02A	• Added insulation blankets & fasteners to maintain bulkhead temperatures within allowable design limits due to removal of Xo 576 bulkhead floodlights and coolant lines
		X	X	47-09-362000-001B	2/6/02A	
FIRST FLIGHT		X	X	07-22-613890-001J	10/10/00A	• Forward bulkhead floodlight cold plate removal

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MCR 19054 VRCS Thruster Heater Enhancement	X	X		16-11-467-0029-001N	11/3/98A	<ul style="list-style-type: none"> <li>Replaced 10 watt heaters with 18 watt heaters for vernier FRCS thrusters                             <ul style="list-style-type: none"> <li>Maintains minimum temperatures above 130 degrees F for leak detection</li> </ul> </li> </ul>
MCR 19112 Wireless RF Video Link For EVAs						<ul style="list-style-type: none"> <li>Installed transceivers, combiners, UHF and S-Band antennas, wiring and coax above the sill to provide operational WVS                             <ul style="list-style-type: none"> <li>TCS Liner Retainers</li> <li>Structures</li> <li>TCS Blankets</li> </ul> </li> </ul>
Mission Kit MV0874A			X X X	14-09-367000-001X 157-02-340004-002L 37-09-362000-001B8	7/12/99A 4/14/99A 7/15/99A	
MCR 19531 ET Separation Camera ICD Update		X		163-03-350013-001K	7/5/01A	<ul style="list-style-type: none"> <li>Updated the Orbiter ICD to reflect the new heavier GFE ET separation cameras</li> <li>Structural interface certification for new GFE cameras</li> </ul>
Mission Kit MV0456A						

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	Test	Analysis	Similarity			
MCR 18212 UHF Space Comm System Mission Kit MV0075A		X	X	22-613400-001H	1/27/99A	<ul style="list-style-type: none"> <li>• Orbiter scar assoc. w/ instln of UHF Space Comm System/SSOR                             <ul style="list-style-type: none"> <li>• Panel O6 &amp; R15 modifications</li> <li>• Antenna instln provisions</li> <li>• SSOR instln provisions</li> <li>• Wiring/coax cable installations</li> <li>• Cooling duct orifice plate mod</li> </ul> </li> </ul>
MCR 18238 FRCS Beryllium Heat Sink Deletion				N/A		<ul style="list-style-type: none"> <li>• Removed the FRCS thruster beryllium heat sinks for weight savings (-49 lbs)                             <ul style="list-style-type: none"> <li>• Heat sinks not required based on flight data and revised thermal analysis</li> </ul> </li> </ul>
MCR 19042 Lightweight Mission Specialist Seats				N/A		<ul style="list-style-type: none"> <li>• Completed re-ID on the crew compartment door &amp; LIOH door assemblies to reflect mushroom stud installation</li> </ul>

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	Test	Analysis	Similarity			
MCR 19286 ODS Scar Modifications		X		116-04-332401G	6/6/00A	• Fan adapter mounting plate mounted to the floor of the internal airlock
Mission Kit MV0075A		X		140-04-3331002H	3/17/00A	• Crew module modification to accommodate ODS external A/L
		X		158-02-340004-002M	6/6/00A	• Mid fuselage structural assembly
		X		131-02-370004-002H	3/17/00A	• PLBD structural assembly –slidewire aft fitting assembly
		X		134-01-320101-058H	12/21/99A	• Fuselage structural assembly
<ul style="list-style-type: none"> <li>• ODS scar includes structural and avionics modifications necessary for installation of ODS in bays 1/2 or 3:                             <ul style="list-style-type: none"> <li>• Crew module/AFD electrical wiring provisions</li> <li>• Electrical feed-troughs in payload bay and Xo 1307 bulkhead</li> <li>• Vehicle wiring installations (forward, mid and aft)</li> <li>• Xo 636 frame modification to provide secondary structure support for fluid lines and cables</li> <li>• D&amp;C panel and MPCA 3 modifications</li> <li>• Internal airlock fan package adapter plate</li> <li>• Extender harnesses for bay 3 ODS installation</li> <li>• Slide wire relocation from bay 12 to bay 13 (installed at KSC)</li> </ul> </li> <li>• Excludes provisions for fluid resource transfer and EMU servicing</li> </ul>						

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	Test	Analysis	Similarity			
MCR 19363 1-String GPS/3-String GPS Scar		X		N/A  16-09-061001AE	8/1/01A	<ul style="list-style-type: none"> <li>• Wiring and equipment installation provisions</li> <li>• TCS blanket assemblies supporting 3-string GPS in crew compartment</li> </ul>
<ul style="list-style-type: none"> <li>• 1-string GPS/3-string GPS installation includes:                             <ul style="list-style-type: none"> <li>• Wiring/wiring hardware modifications</li> <li>• TCS blanket assemblies supporting 3-string GPS in crew compartment</li> <li>• Secondary structure/mounting hardware for single string system receiver (MAGR-S) in crew compartment bay 3B</li> <li>• GPS coax cables &amp; mounting hardware to convert upper/lower L-Band/HEMI antennas for future 3 string application</li> <li>• D&amp;C (GPS to TACAN) kit changing illuminated flight deck panels &amp; decals supporting single string scar equipment</li> </ul> </li> </ul>						

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MCR 10311 Hydraulic Bootstrap Unloader Valve Replacement (Attrition)		X	X	01G-30-284-0438-0001G	6/7/88A	<ul style="list-style-type: none"> <li>• Installation of three modified hydraulic unloader valves to preclude excessive internal leakage                             <ul style="list-style-type: none"> <li>• Modification includes the installation of an accumulator port filter and reworked pilot valve seat</li> </ul> </li> </ul>
MCR 11618 Nose Cap Bolt Spotface Diameter Verification				N/A		<ul style="list-style-type: none"> <li>• Verified nose cap bolts are spotfaced per drawing requirements</li> </ul>
MCR 11618 Electrical Grounding For Pyro Connector Clip				N/A		<ul style="list-style-type: none"> <li>• Installed an electrical grounding conductor strip on the drag chute pyro connector clip in the vertical tail trailing edge</li> </ul>
MCR 11618 Supplemental Decal Kit				N/A		<ul style="list-style-type: none"> <li>• Changed three label decals to reflect actual bus circuits on forward flight deck panels L1 &amp; C3</li> </ul>

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	Test	Analysis	Similarity			
MCR 11618 Elevon Trailing Edge Tile Substitution (Attrition)				N/A		<ul style="list-style-type: none"> <li>Substituted tile on the inboard elevon, inboard end with 0.50 inch hole in the class 1 strain isolator pad to clear protruding head fasteners ensuring satisfactory tile bonding</li> </ul>
MCR 11618 Aft Fuselage Ballast Container Shims				N/A		<ul style="list-style-type: none"> <li>Installed shims in aft fuselage ballast containers when ballast (slugs) are installed</li> </ul>
MCR 11618 FRC2 TCS Blanket Modification				N/A		<ul style="list-style-type: none"> <li>Modified MLI blanket to clear wire &amp; tubing in FRCS compartment</li> </ul>
MCR 11618 Main Display Console Closeout Frame Lightning Protection				N/A		<ul style="list-style-type: none"> <li>Performed bonding checks per clarified lightning protection requirement on crew module console b/t top panels F6 &amp; F7 and top panels F7 &amp; F8</li> </ul>

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MCR 11817 Aft Fuselage Wire Protection				N/A		• Relocated aft harnesses from the floor to aft sidewall
MCR 12154 ET Umbilical Door Latch/Drive Actuator Torque Limiter Modification	X X	X X		03-45-287-0041-0001H 03-45-287-0020-0001H	12/19/97A 12/19/97A	• Installation of redesigned torque limiters for the ET door drive/latch actuators improving reliability
MCR 12415 Body Flap Cove Seal Material Change (Attrition)				N/A		• Replacement of Asbestos parts on B/F seal assemblies
MCR 12465 Wing-To-Fuselage Gap Filler Replacement (Attrition)				N/A		• Replacement of pillow type gap filler with corrected design of class 2 FRSI

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MCR 12516 Star Tracker Interchangeability (Attrition)				N/A		<ul style="list-style-type: none"> <li>Modified panel assembly F7A7 to allow for installation of interchangeable star tracker</li> </ul>
MCR 12581 ET Door Actuator PIND Tested Switches (Attrition)				N/A		<ul style="list-style-type: none"> <li>Substituted particle impact noise detection (PIND) vibration tested switches on the ET door actuators &amp; latches</li> </ul>
MCR 12586 CFE OPS/Payload Recorder Interchangeability (Attrition)				N/A		<ul style="list-style-type: none"> <li>Installed interchangeable recorder (previously transitioned from GFE to CFE)</li> </ul>
MCR 13210 TPS – Damage-prone LRSI Replacement (Attrition)				N/A		<ul style="list-style-type: none"> <li>Replaced damage prone LRSI tiles with FRCI-12, FIB or FRSI                             <ul style="list-style-type: none"> <li>Replacement areas include all carrier panel tile and LRSI adjacent to RCS thrusters</li> </ul> </li> </ul>

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	Test	Analysis	Similarity			
MCR 14696 MPS Helium Check Valve Modification	X	X		02-10-284-0472-0012B	12/12/97A	<ul style="list-style-type: none"> <li>Replaced six GHe check valves on redesigned panel to withstand higher purge flow rate to preclude wear of check valve poppet skirt and bore</li> </ul>
MCR 16708 Crew Hatch TPS Redesign (Attrition)				N/A		<ul style="list-style-type: none"> <li>Replaced LI900 tiles with white FRCI-12 tiles to improve durability and minimize pre-launch repairs</li> </ul>
MCR 17112 PLB Door Expansion Joint Dog Bone Seal		X		103-02-370004-0041-002G	12/12/97A	<ul style="list-style-type: none"> <li>Modified eight locations of the PLBD expansion joints #1 &amp; #2 to maintain proper seal position during joint expansion                             <ul style="list-style-type: none"> <li>Replaced existing retainer clips with titanium extension brackets &amp; radius blocks on the LH &amp; RH PLBDs</li> </ul> </li> </ul>

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	Test	Analysis	Similarity			
MCR 17172 Cabin Positive Purge Relief Valve (Attrition)	X	X		35-250-0002-0100C	10/21/92	<ul style="list-style-type: none"> <li>• Replaced cabin positive pressure relief, bleed, and isolation valves</li> <li>• Eliminates potential valve leakage and valve position indication failure</li> </ul>
	X	X		02-22-250-0002-0050C	10/21/92	
			X	04A-22-250-0002-0050C	12/15/97A	
MCR 17177 PLBD Strongback Attach Nutplates/Rivets (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Provided interchangeability of nutplates and rivets for installation at all 272 PLBD strongback attach points</li> <li>• Existing nutplate threads subject to galling</li> </ul>
MCR 17177 Reverse Installation-Midbody Helium Tank Strut Attach Fitting Bolts				N/A		<ul style="list-style-type: none"> <li>• Reversed the installation of the midbody helium tank strut attach fitting bolts and nuts to facilitate removal of the bolts for structural inspection of the strut and fitting bores</li> </ul>

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MCR 17177 CCTV Monitor 2 Harness Stowage				N/A		<ul style="list-style-type: none"> <li>Removed P228 &amp; P229 connectors for CCTV monitor 2 in the aft flight deck, and caps &amp; stows associated wires</li> </ul>
MCR 17177 Sill Longeron Blanket Attach Fastener Removal				N/A		<ul style="list-style-type: none"> <li>Removed fasteners from the midbody side skin due to elimination of TCS blankets above the sill longeron</li> </ul>
MCR 17177 Midbody Vent Door Receptacle Connector Plate Reference Designator Reversal				N/A		<ul style="list-style-type: none"> <li>Corrected PV&amp;D motor/actuator assembly electrical connector plate designator callouts on the LH/RH sides of the PLB vent doors 3, 5 &amp; 6                             <ul style="list-style-type: none"> <li>Avoids future mismatching of the connectors</li> </ul> </li> </ul>

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MCR 17177 MDM Rechannelization				N/A		<ul style="list-style-type: none"> <li>• Re-wired measurement from MDM OA3 card 5 to OA3 card 1 incorporating discrete measurement V76X4027E                             <ul style="list-style-type: none"> <li>• Provides 10 samples per second for both formats 129 and 166</li> </ul> </li> </ul>
MCR 17177 LH2 Disconnect Seal Curtain Attach Plate Corrosion Protection Verification				N/A		<ul style="list-style-type: none"> <li>• Verified present specification of chemical film is present in lieu of anodize on the LH2 disconnect &amp; curtain seal on the disconnect plate assembly</li> </ul>
MCR 17177 Larger Duct Clamps for Purge Circuit #1 (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Installed larger duct clamps for purge circuit #1 in the aft fuselage</li> </ul>

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MCR 17177 Hydraulic Pump Flange Bearing Surface Redesign				N/A		<ul style="list-style-type: none"> <li>Replaced main pump mounting washers with larger diameter washers to achieve sufficient bearing surface area minimizing "coining" of the pump flange during bolt torquing</li> </ul>
MCR 17177 Black RTV Coating On OMS Interface Thermal Barrier				N/A		<ul style="list-style-type: none"> <li>Added black RTV coating to cover entire thermal barrier on forward edge of OMS fuselage interface to provide erosion resistance</li> </ul>
MCR 17319 FEA Upgrade (Attrition) Mission Kit MV0549A		X		03-19-434-0062-0001K	7/14/95A	<ul style="list-style-type: none"> <li>Modified PLB floodlight ballast to alleviate overstressed components during lamp start up</li> </ul>
MCR 17727 Hydraulics Bellows Accumulator	X	X	X	01-30-284-0597-0001 02-30-364-0011-0024F	11/19/98A 7/19/98A	<ul style="list-style-type: none"> <li>Replaced the three piston hydraulic accumulators with three new steel bellows accumulators, associated hardware/tubing, and wiring</li> <li>Accumulator</li> <li>TCS</li> </ul>

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MCR 17820 Floodlight Lamp Assembly Upgrade (Attrition) Mission Kit MV0549A	X		X	19-704032-001F	5/18/01A	<ul style="list-style-type: none"> <li>Installed interchangeable new metal halide flood lamp assemblies (replaces Teflon jacketed seals with RTV seals) to eliminate corona arcing concerns</li> </ul>
MCR 18083 TPS - Mid-Fuselage Sidewall FRSI Gap Deletion				N/A		<ul style="list-style-type: none"> <li>Deleted edge member and installs continuous FRSI on aft payload bay door umbilical access panel to simplify FRSI installation</li> </ul>
MCR 18189 MPCA 1 & 2 Heater Implementation		X		06-21-764430-001I	9/5/97A	<ul style="list-style-type: none"> <li>Modified spare mid power control assemblies (MPCAs) 1 &amp; 2 for compatibility with EDO pallet and ODS (Ext A/L)</li> </ul>
MCR 18224 Flipper Door Material Change to Aluminum	X	X		19-07-198000-001Q	5/5/99A	<ul style="list-style-type: none"> <li>Provided new aluminum flipper doors with FRSI insulation in place of heavier titanium/inconel flipper doors (weight saver)</li> </ul>
MCR 18235 Midbody GN2 Tube/GSE Track Pan Interference				N/A		<ul style="list-style-type: none"> <li>Re-routed CRES tubing to eliminate interference between GSE track pan and GN2 tubing</li> </ul>

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MCR 18397 Nose Cap Blanket Redesign (Attrition)				N/A		<ul style="list-style-type: none"> <li>Replaced Nextel 312 nose cap cavity blankets with Nextel 440 blankets</li> <li>Nextel 440 blankets have an allowable maximum temperature of 2500 degrees F for 100 missions</li> <li>The Nextel 312 blankets are allowed 2000 degrees F for 100 missions, which has been exceeded and could lead to loss of insulating capabilities</li> <li>Performance enhancement and eliminates frequent inspection/replacement of the nose cap blankets</li> </ul>
MCR 18433 Wing Glove Fastener Changeout		X		01-04-000020-001	5/8/98A	<ul style="list-style-type: none"> <li>Replaced titanium shear head Hi-Loks with steel tension head Hi-Loks on the wing glove upper fittings at Xo 919 and Xo 979 (6 fasteners per fitting x 4 fittings)</li> <li>Eliminates ascent constraints for wing down bending load cases at M = 1.05 and M = 1.10</li> </ul>

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MCR 18451 Wing Doubler Modification		X		141-05-100004-002I	1/22/97A	<ul style="list-style-type: none"> <li>Added doublers to the inboard panels of the wing spar webs @ Xw 1249, Xw 1307, &amp; Xw 1365 after removing load indicators to delete wing flight restrictions allowing utilization of additional performance capability eliminating structure fluctuations of negative margins for 6.0 loads</li> </ul>
MCR 18524 Elevon Polyimide Seal Springs (Attrition)		X		21G-07-198000-001P	11/15/01A	<ul style="list-style-type: none"> <li>Replaced 2 polyimide seal springs at elevon hinges with stiffer springs preventing seals from pivoting in elevon up position                             <ul style="list-style-type: none"> <li>Precludes heating flow into the elevon cove causing local thermal damage</li> </ul> </li> </ul>

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MCR 18563 Thermal Protection System - Fleet Modifications Elevon Cove Center Hinge Seal Stiffening				N/A		<ul style="list-style-type: none"> <li>Added RTV filler to elevon center hinge seals providing improved positioning of seal interface fingers to attain better fit to the Columbian seal.                             <ul style="list-style-type: none"> <li>Increases seal compression to reduce local flow heating.</li> </ul> </li> </ul>
OMS Pod Tile Rework (Attrition) Mission Kit MV0598A				N/A		<ul style="list-style-type: none"> <li>Replaced 2 tiles with reduced thickness tiles on RH &amp; LH OMS pods lower aft edge to eliminate interference with T-0 umbilical panel</li> </ul>
Vertical Stabilizer/Drag Chute Blanket Change (Attrition)				N/A		<ul style="list-style-type: none"> <li>Substitution of reduced edge thickness blankets on the vertical stabilizer/drag chute compartment sides                             <ul style="list-style-type: none"> <li>Avoids protrusion of the blankets beyond the edge of adjacent tiles</li> </ul> </li> </ul>

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<b>MCR 18563</b> Thermal Protection System - Fleet Modifications (Cont'd) Wing Lower Access Panel Tile Gap Filler Change (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Substitution of stiffer gap fillers around wing lower access panel tiles at Xw 923.75 - 1112.06 and station 1225 - 1365</li> </ul>
Body Flap Upper Surface Tile Upgrade (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Substitution of FRCI-12 tiles in place of LI-900 tiles on 0.115 strain isolator pads on the body flap upper surface access doors                             <ul style="list-style-type: none"> <li>• Increases strength and stabilizes tile installation</li> </ul> </li> </ul>
Main Landing Gear Door Thermal Barrier End Caps (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Added thermal barrier end caps to prevent flaring of the thermal barriers when main landing gear doors open prior to landing                             <ul style="list-style-type: none"> <li>• Precludes thermal barrier segment damage due to billowing effect when barriers are exposed to air flow</li> </ul> </li> </ul>

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MCR 18563 Thermal Protection System - Fleet Modifications (Cont'd)  Forward Fuselage/ Chin Panel Nextel 440 Gap Fillers (Attrition)		X		31-08-399200-001P	10/7/96A	<ul style="list-style-type: none"> <li>• Substituted Nextel 440 material cover and thread gap fillers for ceramic fiber and quartz thread gap fillers between tiles on the forward fuselage and the chin panel                             <ul style="list-style-type: none"> <li>• Improves durability and eliminates end fold and loop stitching on gap fillers</li> </ul> </li> </ul>
Window Periphery Sleeving / RTV (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Substituted sleeving and top coat of RTV-566 in place of full depth RTV-566 on external insulation around periphery of the forward windows (1 through 6), observation windows (7 &amp; 8) and side hatch</li> </ul>

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	Test	Analysis	Similarity			
<b>MCR 18563 Thermal Protection System - Fleet Modifications (Cont'd)</b>  <b>Wing Stub Carrier Plate Tile Upgrade (Attrition)</b>				N/A		<ul style="list-style-type: none"> <li>Substituted FRCI-12 (12 pcf) tiles in place of LI-900 (9 pcf) tiles on the wing stub external insulation to increase durability</li> </ul>
<b>FRCS Thermal Barrier Reduced Tail Thickness (Attrition)</b>				N/A		<ul style="list-style-type: none"> <li>Substituted thermal barriers with a reduced tail thickness (four layers of fabric to two layers of fabric) around the FRCS thrusters</li> </ul>

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	Test	Analysis	Similarity			
MCR 18593 MPS 4 Inch Disconnect Re-Identification			X	02-10-284-0390-006D	3/3/98A	<ul style="list-style-type: none"> <li>• Re-Identified the MPS 4 inch disconnect valve insulation installation to reflecting longer replacement screws to engage/lock into the Rosan inserts in the QD</li> </ul>
MCR 18738 Hydraulic Drain Line Modification	X	X		05-30-580709N	5/12/98A	<ul style="list-style-type: none"> <li>• Tubing and mounting hardware to reroute PDU drain lines via the Xo 1307 bulkhead to reservoirs in support of oleophobic filter removal                             <ul style="list-style-type: none"> <li>• Eliminates the potential of draining hydraulic fluid overboard</li> </ul> </li> </ul>

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	Test	Analysis	Similarity			
MCR 18755 HDFP Modifications						
Window 9 Flight Cover			X	03-25-661611-001I	1/29/01A	<ul style="list-style-type: none"> <li>Modified W9 bracket to eliminate interference between the W9 flight covers and the monitor bracket for the MEDS MDU</li> </ul>
Flight Data File Tether Points		X		01-25-002049-001	3/7/00A	<ul style="list-style-type: none"> <li>Added tether attach fitting points on MEDS panel (restraint fittings for data files, pencils, etc.)</li> </ul>
Modified Port/ Starboard PSA			X	02-25-000620-001G	1/21/02A	<ul style="list-style-type: none"> <li>Modified assembly liner cushions to support required tools                             <ul style="list-style-type: none"> <li>Starboard PSA modified to support HST tools</li> <li>Port PSA modified to accept a cutter previously flown in TSA on other vehicle</li> </ul> </li> </ul>

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	Test	Analysis	Similarity			
MCR 18806 Main Hydraulic Pump Electro-Depressurization Valve (EDV) Solenoid Redesign			X	04-30-281-0029-0002F	5/13/96A	<ul style="list-style-type: none"> <li>Implemented design improvements in EDV solenoid connector and wiring to reduce susceptibility to damage during handling and installation</li> </ul>
MCR 18866 Longeron Bridge/Sidewall Carrier Attach Point Redesign	X	X		153-02-340004-002L	10/16/96A	<ul style="list-style-type: none"> <li>Completed installation of increased capability attach clip assemblies to meet ICD requirements for longeron bridge/sidewall carriers</li> </ul>

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	Test	Analysis	Similarity			
<b>MCR 18872</b> Radiator Isolation and Debris Protection  Mission Kit MV0520A	X	X		03-24-203-0002-0013C	11/15/01A	<ul style="list-style-type: none"> <li>• Modified ECLSS radiators to include shielding consisting of 0.02 inch thick aluminum strips bonded to the cooling tubes and blankets</li> <li>• Provided panel isolation capability to the freon loops in the event of damage resulting in leakage</li> <li>• Modified L4A1 panel assembly on side console displays and controls to agree with circuit breaker changes</li> <li>• Isolation valve switch nomenclature change – replaced flight deck switch panel L2A1 with a new light gray with white lettering illuminated panel with (8) switches</li> <li>• Helium check valve used in radiator isolation loops 1 &amp; 2 of ATCS with Freon 21</li> <li>• Freon system transducer installation - updated stress analysis for the ATCS</li> </ul>
	X	X		01-24-284-0603-0001A	6/28/99A	
				N/A		
				N/A		
	X			04-10-284-0472-0001F	3/18/99A	
		X	02-24-634480F	6/28/99A		

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	Test	Analysis	Similarity			
MCR 18980 MPCA 1 Re-ID for FCMS Fuses (Attrition)	X X	X		04-21-770000H 03-20-800-165-501B 06-21-764430-001I	10/16/01A 8/19/99A 9/5/97A	<ul style="list-style-type: none"> <li>• FCMS wire harnesses</li> <li>• FCMS certification for 100 missions (was 3 missions)</li> <li>• Performed re-ID of MPCA 1 to reflect Fuel Cell Monitoring System (FCMS) accomplished for STS-87                             <ul style="list-style-type: none"> <li>• Substituted three 20 amp fuses with three 1 amp fuses</li> <li>• Re-identification was deferred</li> </ul> </li> </ul>
MCR 19001 Columbium Seal Spring (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Substituted stiffer Columbium seal springs in the inboard and outboard elevon cove for the current springs which are not stiff enough and may cause cove structure damage</li> </ul>
MCR 19007 Potable Water Tank Cover Modification (Attrition)				N/A		<ul style="list-style-type: none"> <li>• Provided water tank cover interchangeability</li> </ul>

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	Test	Analysis	Similarity			
MCR 19027 Body Flap Cove Refurbishment			X	118-03-357004-002F	4/16/98A	<ul style="list-style-type: none"> <li>• Installed body flap &amp; rub plate doublers and rivets to replace corrosion damaged parts due to deterioration of corrosion inhibiting primer</li> <li>• Aft fuselage structural Installation</li> </ul>
			X	157-03-350013-001K	4/16/98A	
MCR 19029 Device Driver Unit LRU Replacement	X	X		01-17-464-0154-0001	10/18/01A	<ul style="list-style-type: none"> <li>• Installed a new flight control power supply (FCPS) with redefined nomenclature as the "Device Driver Unit" (new DDU) to replace the Display Driver Unit (old DDU) as part of the MEDS modification in the crew compartment</li> </ul>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">FIRST FLIGHT</div>						

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	Test	Analysis	Similarity			
MCR 19045 Wing Leading Edge Protective Shielding	X	X		35-08-199200-003R	2/25/99A	<ul style="list-style-type: none"> <li>Installed earmuffs &amp; spar insulators to the wing leading edge panels to preclude micro-meteoroid orbital debris impact damage</li> </ul>
MCR 19072 Forward Fuselage Door Access Covers Modification				N/A		<ul style="list-style-type: none"> <li>Replaced the RH &amp; LH (2) Xo 378 bulkhead access door covers                             <ul style="list-style-type: none"> <li>Incorporates fastener counterbore/material depth changes to resolve door dimpling effects</li> </ul> </li> </ul>
MCR 19131 Vertical Tail Sector & Linear Seal Design Modification			X	137-06-200002-002G	8/18/98A	<ul style="list-style-type: none"> <li>Installed seals (8 sector &amp; 14 linear) made from Inconel 718 material to bridge the OML gap between the vertical tail fixed fin and the conical seal to provide high temperature (~900 F) environment protection</li> </ul>

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	Test	Analysis	Similarity			
MCR 19162 CRES 303 PIP Pins Replacement  Mission Kit MV0075A		X		09-28-593201-001Q	8/8/00A	<ul style="list-style-type: none"> <li>Replaced current CRES 303 PIP pins with A286 material for the spindle portion of the quick release pins on hinge assemblies                             <ul style="list-style-type: none"> <li>EESS JSC</li> <li>B-hatch KSC</li> <li>A-hatch PLMD</li> </ul> </li> </ul>
MCR 19191 Wing Truss Tube Modification		X		144-05-100004-002J	10/8/99A	<ul style="list-style-type: none"> <li>Modified two (LH/RH) OV-102 specific thin walled wing truss tubes with bonded on doublers to eliminate negative safety margin</li> </ul>
MCR 19217 Orbiter Marking Revision				N/A		<ul style="list-style-type: none"> <li>Applied approved white marking paint to cover "old" markings that lie outside of the new markings                             <ul style="list-style-type: none"> <li>Applied NASA "meatball marking" to LH wing in current "Flag" location and adds "Columbia and Flag" to RH wing</li> </ul> </li> </ul>

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	Test	Analysis	Similarity			
MCR 19288 Base Heat Shield/Engine Dome Bushings			X	114-03-351900-010G	11/15/00A	<ul style="list-style-type: none"> <li>Installed bushings, nutplates, shims, multiple sized doublers, and flight guide pins to align the base heat shields and dome heat shields during repairs</li> <li>Deleted lower doublers as lower guide pins have been deleted</li> <li>BHS guide pins</li> </ul>
		X	X	156-03-350013-001K	10/27/00A	
MCR 19292 Negative Margin Tiles Due To PE Loads (Attrition)				N/A		<ul style="list-style-type: none"> <li>Replaced LI-900 negative margin tiles with FRCI-12 tiles</li> </ul>

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	Test	Analysis	Similarity			
MCR 19334 RMS Viewing Light Captive Fastener Change		X	X	04-19-434-0063-0001E	9/16/98A	• Added new parts for mounting a floodlight assembly with the CTVC camera on the wrist joint of the RMS
MCR 19362 Drag Chute Compartment Modification	X X	X X		139B-06-200002-002G 07-44-621-0076J	3/7/00A 7/18/00A	• Drag chute mortar assembly rivet fastener replacement with Hi-Lok fasteners due to higher reaction loads
MCR 19370 Provision Stowage Assembly Freon Flow Sensor Clearance				N/A		• Installation of support assembly hardware/isolators supporting the relocation of the ECLSS freon flow sensor to avoid interference with the provision stowage assembly strut

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	Test	Analysis	Similarity			
MCR 19376 Milson Fastener Redesign		X	X	02-25-000907-001A	6/25/01A	<ul style="list-style-type: none"> <li>• Modification installs redesigned Milson fasteners in the following components:                             <ul style="list-style-type: none"> <li>• MA9N Bags/Frame</li> <li>• Vehicle Wire Trays</li> <li>• Mid-deck Modular Stow Kit</li> <li>• Latch modification</li> <li>• Panels-Avionics Bay C/O Kit</li> <li>• Thermal Debris Panels</li> </ul> </li> </ul>
			X	142-04-331002H	8/22/00A	
			X	03-25-661602-001N	6/25/01A	
			X	02-25-660800-001B	6/29/01A	
			X	07-25-661612-001F	7/5/01A	
MCR 19392 Base Heat Shield Acoustic Sensor Cap Installation				N/A	6/25/01A	<ul style="list-style-type: none"> <li>• Installed two new acoustic sensor caps on the aft fuselage base heat shield acoustic sensors to preclude light flash sensor sensitivity tolerance changes at SSME/SRB ignition</li> </ul>
MCR 19470 Mid-Fuselage Wire Protection				N/A		<ul style="list-style-type: none"> <li>• Installation of convoluted tubing, clamps, teflon tape, and miscellaneous hardware for protection of orbiter wiring in the LH &amp; RH PLB wire trays</li> </ul>

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	Test	Analysis	Similarity			
MCR 19504 Criticality 1/1 Wiring Landing Gear Down Redesign			X	04-21-763340-001F	11/22/00A	<ul style="list-style-type: none"> <li>Modified FPCA #1 and vehicle wiring to eliminate three landing gear down related criticality 1/1 CILs</li> </ul>
MCR 19512 OV-102 MPS Pneumatic Control System Purge Ports				N/A		<ul style="list-style-type: none"> <li>Added purge ports for purging of pneumatic lines during brazing                             <ul style="list-style-type: none"> <li>Partial implementation in support of helium check valve replacements (MCR 14696)</li> </ul> </li> </ul>
MCR 19513 Orbiter/ET Aft Attach Fitting Modification		X		06-45-565201-001R	9/18/01A	<ul style="list-style-type: none"> <li>Modified LH/RH Orb/ET aft attach separation system container assemblies with new "L" fitting for the titanium base plate to preclude movement during ET separation</li> </ul>
MCR 19518 APU J.C. Carter AHC chg. To Fairchild Style	X	X		01-16-276-0018-2453	8/9/01A	<ul style="list-style-type: none"> <li>Replaced APU couplings to eliminate need for SCAPE operations within the aft compartment</li> </ul>

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	Test	Analysis	Similarity			
MCR 19519 S-Band Coax Replacement in Bay 3A				N/A		<ul style="list-style-type: none"> <li>Installed new flexible rerouted coax cable and mounting hardware provisions to replace burned out semi-rigid coax in bay 3A</li> </ul>
MCR 19520 OV-102 Wire Removal For Age-Life Testing				N/A		<ul style="list-style-type: none"> <li>Installed wire segments, splices and associated hardware to replace wire segments removed in support of age life testing of flown orbiter Kapton insulation</li> </ul>
MCR 19521 OV-102 Wire Removal For Arc-Track Testing				N/A		<ul style="list-style-type: none"> <li>Installed wire segments, and associated hardware to replace wire segments removed in support of arc-track testing of flown orbiter Kapton insulation</li> </ul>

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	Test	Analysis	Similarity			
MCR 19530 RP05 Helium Tank Access Door Fix		X		123-03-73A000015-1001F	5/28/01A	<ul style="list-style-type: none"> <li>• Installed new structural fittings to prevent cracks due to severe vibro-acoustic environment during main engine ignition</li> </ul>
MCR 19594 Mid-Body Bay 6 Left Hand H2 Tank to Vertical Wire Tray Contact				N/A		<ul style="list-style-type: none"> <li>• Modified avionics shelf #6 in PLB #5 with hardware provisions for wire trays to further secure wire harnesses                             <ul style="list-style-type: none"> <li>• Alleviates tray deflection/ twisting and H2 tank contact due to the large number of stiff cables supported</li> </ul> </li> </ul>

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	Test	Analysis	Similarity			
MCR 19652 HDFF Delta Task Modifications  Modified Sleep Restraint  <div style="border: 1px solid black; padding: 2px; display: inline-block;">FIRST FLIGHT</div>			X	03-25-000610-048C	1/24/02A	<ul style="list-style-type: none"> <li>• Modifications to the cummerbun, strap adjusters, arm holes, length, and coating attach hooks per crew evaluation recommendations</li> </ul>
TEPC/Window Shade Frame Interference Elimination Modification			X	08-25-661612-001G	10/26/01A	<ul style="list-style-type: none"> <li>• Modified locker closeout panel adjacent to the side wall at the top of mid-deck bay 3A</li> <li>• Eliminates TEPC (tissue equivalent proportional counter) interference with the adjacent window shade frame</li> </ul>

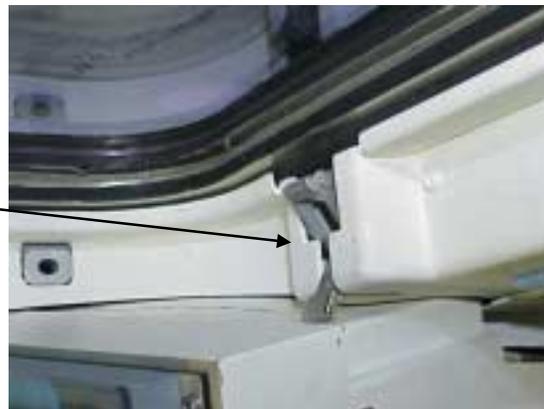
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	Test	Analysis	Similarity			
MCR 19653 HDFS Delta Task Modifications Window 7 Flight Cover  <div style="border: 1px solid black; padding: 2px; display: inline-block;">FIRST FLIGHT</div>			X	04-25-661611-001J	1/8/02A	<ul style="list-style-type: none"> <li>Added a cutout to avoid interference with COAS bracket due to MEDS implementation</li> </ul>

Nominal W7 shade installation



Latch

COAS Support

Window Shade

Window #7 shade interference with MDU

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**Process Improvements**

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	Test	Analysis	Similarity			
MCR 11618 Bay 8 Keel Fitting TCS Blanket Mod				N/A		• Added cutouts (slits) modifications to PLB #8 bridge blankets for ease of blanket removals
MCR 17177 Orbiter Waste Water QD		X		03-23-286-0075-0001E	9/30/99A	• Changed the urine filter & orbiter interface QD to an assembly
MCR 17605 Multifunction Electronics Display Subsystem (MEDS) Implementation	X	X		03-19-409-0185-0020C	3/3/00A	• Installation of MEDS cabling/wiring modifications & cooling hardware from the LH/RH AML area to the forward flight deck for PLT/CDR displays and aft ADI display consoles • Multifunction Display Unit (MDU) is a liquid crystal display assy that generates, refreshes, and updates alphanumeric and graphical color formats from display data received from the IDP
MCR 17909 Non-functional Acoustic Sensor Deletion (Attrition)  Mission Kit MV0846A				N/A		• Replaced instrumented tiles with production tiles on the aft fuselage dome heat shield

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	Test	Analysis	Similarity			
MCR 18165 Multifunction Electronics Display Subsystem (MEDS) Implementation	X	X		01-19-409-0185-0010A	3/08/99A	<ul style="list-style-type: none"> <li>• Installation of additional MEDS hardware</li> <li>• IDP (Integrated Data Processor) receives/processes GPC and outputs to MEDS display units                             <ul style="list-style-type: none"> <li>• Receives and processes health status of MEDS components</li> </ul> </li> <li>• ADC (Analog to Digital Converter)                             <ul style="list-style-type: none"> <li>• Converted data is sent upon request to the IDP for processing</li> </ul> </li> <li>• Added new ducting and brackets adjacent to forward consoles, including six new attach points to flight deck floor (replaces 5 ducts and 2 brackets and adds 7 ducts and 11 brackets)</li> <li>• J config LCDA MDU</li> <li>• Modified D&amp;C panels for MEDS usage</li> </ul>
	X	X		01-19-409-0185-0030A	3/08/99A	
	X	X		04-22-613760-001E	2/21/00A	
	X	X		03-19-409-0185-0020C	3/03/00A	
	X		X	03-19-730189-002F	2/26/98A	

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	Test	Analysis	Similarity			
MCR 18222 MLG/NLG Wheel Well Aluminum Tape Replacement		X		02-09-165000-001C	1/22/97A	<ul style="list-style-type: none"> <li>Replaced heavy weight aluminum foil (L-T-80) tape in the main and nose landing gear wheel wells with light weight aluminized Kapton (MB0135-050 Type V) tape for weight savings</li> </ul>
MCR 18563 FRCS Tile Change To FRCI-12 (Attrition)				N/A		<ul style="list-style-type: none"> <li>Substitution of FRCI-12 tiles in place of LI-900 tiles near the FRCS Yo &amp; Zo thrusters to preclude in-plane fracturing</li> </ul>
MCR 18855 AETB Tile For Base Heat Shield (Attrition)		X		22B-07-395001-001V	3/17/00A	<ul style="list-style-type: none"> <li>Replaced LI-900 tiles on base heat shield with advanced TPS tiles (AETB-8) for greater impact resistance</li> </ul>

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**Process Improvements**

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	Test	Analysis	Similarity			
MCR 18883 Advanced Air Data Transducer Modification	X	X		010-17-409-0224-0002A	9/3/99A	<ul style="list-style-type: none"> <li>Installation of new advanced air data transducers (AADT) replacing existing (4) air data transducer assemblies in avionics bays 1 &amp; 2                             <ul style="list-style-type: none"> <li>New AADT will eliminate post flight R/R, extensive testing, and recalibration efforts</li> </ul> </li> <li>Modification provides blank orifice plates for the AADT assemblies allowing ECLSS purge disconnection for radiation cooling</li> </ul>
			X		08-22-613400-001H	
MCR 18884 Installation Of Seal Savers In OMS Pods And FRCS				N/A		<ul style="list-style-type: none"> <li>Installed seal savers on all thruster dynatube joints in OMS pods &amp; FRCS to preclude leakage in joint mating surfaces</li> </ul>
MCR 19033 Orbiter/ET Umbilical Plate Gap Delta-Pressure Transducer		X X	X	01-10-415920-010 03-20-449-0178-0101D	7/27/01A 2/26/01A	<ul style="list-style-type: none"> <li>Installed primary and redundant pressure (4) transducers to measure purge pressure in the LH2 and LO2 ET/Orbiter disconnect plate gap</li> </ul>

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**Process Improvements**

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	Test	Analysis	Similarity			
MCR 19088 Hydraulic Temperature Sensor Relocation Modification				N/A		<ul style="list-style-type: none"> <li>Relocated main hydraulic pump case drain temperature sensor measurements to the circulation pump fluid inlets for low fluid temperature monitoring in order to avoid slow starts                             <ul style="list-style-type: none"> <li>Prevents damage and reduces on-orbit pump operation</li> </ul> </li> </ul>
MCR 19099 OMS/RCS Heater Test Point Relocation		X	X	160-03-350013-001K	7/5/01A	<ul style="list-style-type: none"> <li>Removed tethered caps and relocated LH &amp; RH OMS pod heater test point access locations to aft compartment improving accessibility</li> </ul>
MCR 19178 OMS Pod Vernier Thruster Access Panel Tile Change (Attrition)  Mission Kit MV0598A		X		18-07-396001-002O	11/10/97A	<ul style="list-style-type: none"> <li>Replaced LI-900 tiles with TUF1 coated AETB-8 tiles to improve resistance to in-plane fracture</li> </ul>

<b>CONFIGURATION CHANGES AND CERTIFICATION STATUS</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Process Improvements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 19220 DFI Wire Deletion from Replacement Harnesses				N/A		<ul style="list-style-type: none"> <li>Replaced damaged wire harnesses with harnesses rebuilt without inactive wires</li> </ul>
MCR 19263 SUPA Implementation	X	X	X	USA 01-WCS1431A	11/15/01A	<ul style="list-style-type: none"> <li>Installed updated WCS with new shuttle urine pretreat assembly oxone hose section reducing risk of system clogging - 1 hose used/day                             <ul style="list-style-type: none"> <li>Installed on orbit</li> </ul> </li> </ul>
		X	X	03-23-623000-001D	9/28/01A	<ul style="list-style-type: none"> <li>Oxone/water solution</li> </ul>
MCR 19285 OMS/RCS Crossfeed Line Modification	X	X	X	02-12-435011C	4/5/99A	<ul style="list-style-type: none"> <li>Removed high point bleed lines and replaced OMS/RCS 2.5 inch diameter crossfeed lines with 1.5 inch diameter lines</li> </ul>

<b>CONFIGURATION CHANGES AND CERTIFICATION STATUS</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Process Improvements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 19309 ET Door Corrosion RTV Modification				N/A		<ul style="list-style-type: none"> <li>Applied RTV corrosion protection between both LH/RH ET door hinge fittings</li> </ul>
MCR 19309 Vertical Stabilizer TPS Carrier Panel Redesign				N/A		<ul style="list-style-type: none"> <li>Replaced rivets in the support fittings with fasteners and nut plates to facilitate access for vertical stabilizer attach bolt inspection</li> </ul>
MCR 19309 Y-Web Carrier Panel FRSI			X	19-07-396001-002P	7/12/99A	<ul style="list-style-type: none"> <li>Replaced OMS pods Y-web door AFRSI blanket carrier panels with FRSI bonded directly to the Y-web doors</li> </ul>
MCR 19309 Gap Filler Performance Enhancement (Attrition)				N/A		<ul style="list-style-type: none"> <li>Upgraded to Nextel 440 cover, thread and sleeving to improve durability of gap fillers on wings and forward fuselage</li> </ul>

<b>CONFIGURATION CHANGES AND CERTIFICATION STATUS</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Process Improvements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 19313 Development Flight Instrumentation (DFI) Wiring Removal (OV-102 specific)				N/A		<ul style="list-style-type: none"> <li>• Removed non-required/inactive DFI wiring/measurements from specific vehicle areas</li> <li>• Provided associated hardware in support of removals and refurbishment</li> <li>• Removal areas included:                             <ul style="list-style-type: none"> <li>• Aft flight deck/aft fuselage</li> <li>• Body flap</li> <li>• Star tracker door upper/lower panels</li> <li>• PLBD</li> </ul> </li> <li>• Weight reduction of 686 lbs following decrease in MCR scope</li> </ul>
MCR 19337 ET Umbilical Pyro Purge Tubes	X			05-45-565330-001M	7/14/99A	<ul style="list-style-type: none"> <li>• Modified ET LH2 disconnect pyro purge tube lengths to allow for trimming of tube lengths above foam post insulation installation</li> </ul>

<b>CONFIGURATION CHANGES AND CERTIFICATION STATUS</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Process Improvements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 19351 Tile Gap Heating OEX Panel Deletion				N/A		<ul style="list-style-type: none"> <li>Removed lower mid-fuselage TPS, TCS, and instrumentation components/installation associated with the OEX panel                             <ul style="list-style-type: none"> <li>Originally installed on OV-102 to determine the effects of out-of-tolerance tile steps and gaps</li> <li>Testing complete</li> </ul> </li> </ul>
MCR 19356 OV-102 20g Floor Modification (Partial)				N/A		<ul style="list-style-type: none"> <li>Installed hardware provisions/ducting support hardware to reinforce the crew module structural flight &amp; mid-deck floor members for the aft inboard and outboard flight deck seats 1 &amp; 2 (CDR/PLT) and mid-deck seat 5 (MS3) for 20g crash load requirements</li> </ul>
MCR 19381 Lightweight CDR/PLT Seat Back Re-ID		X	X	04-25-39126815-301D	1/29/01A	<ul style="list-style-type: none"> <li>Lightweight mission specialist seats were modified by relocating the seat back angle adjustment lever from the right hand side aft to the right hand side forward.                             <ul style="list-style-type: none"> <li>Completed mod by installing lever re-identification decal</li> </ul> </li> </ul>

<b>CONFIGURATION CHANGES AND CERTIFICATION STATUS</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Process Improvements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 19482 PLBD Carrier Panel Fasteners Koropon Deletion (Attrition)				N/A		<ul style="list-style-type: none"> <li>Implemented requirement to delete old Koropon from payload bay door panel fasteners</li> </ul>
MCR 19527 Orbiter Wire Redundancy Separation				N/A		<ul style="list-style-type: none"> <li>Separated criticality 1 redundant wires for enhanced wire protection                             <ul style="list-style-type: none"> <li>5 of 9 locations in aft fuselage</li> </ul> </li> </ul>
MCR 19535 Heat Shrink Tubing for Forward Pyro Harnesses				N/A		<ul style="list-style-type: none"> <li>Installed heat shrink tubing on frequently handled pyro harnesses</li> </ul>

<b>CONFIGURATION CHANGES AND CERTIFICATION STATUS</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 STS-109 Modifications and Certification**

**Process Improvements**

MCR/Modification	Certification Method			Certification Approval Request No.	Approval Date	Remarks
	Test	Analysis	Similarity			
MCR 23016 Aft Compartment Wire Protection				N/A		<ul style="list-style-type: none"> <li>Installed convoluted tubing and associated hardware for wire protection in the ET attach area</li> </ul>
MCR 23021 MEDS Cooling Vents				N/A		<ul style="list-style-type: none"> <li>Modified panel F7 top cover to preclude debris entry while meeting the requirements for ECLSS decompression and EMI/EMC lightning requirements</li> </ul>

	Presenter:
	Organization/Date: Orbiter/02-14-02

# MISSION KITS BACKUP

**ORBITER PROVIDED MISSION KITS**

Presenter:

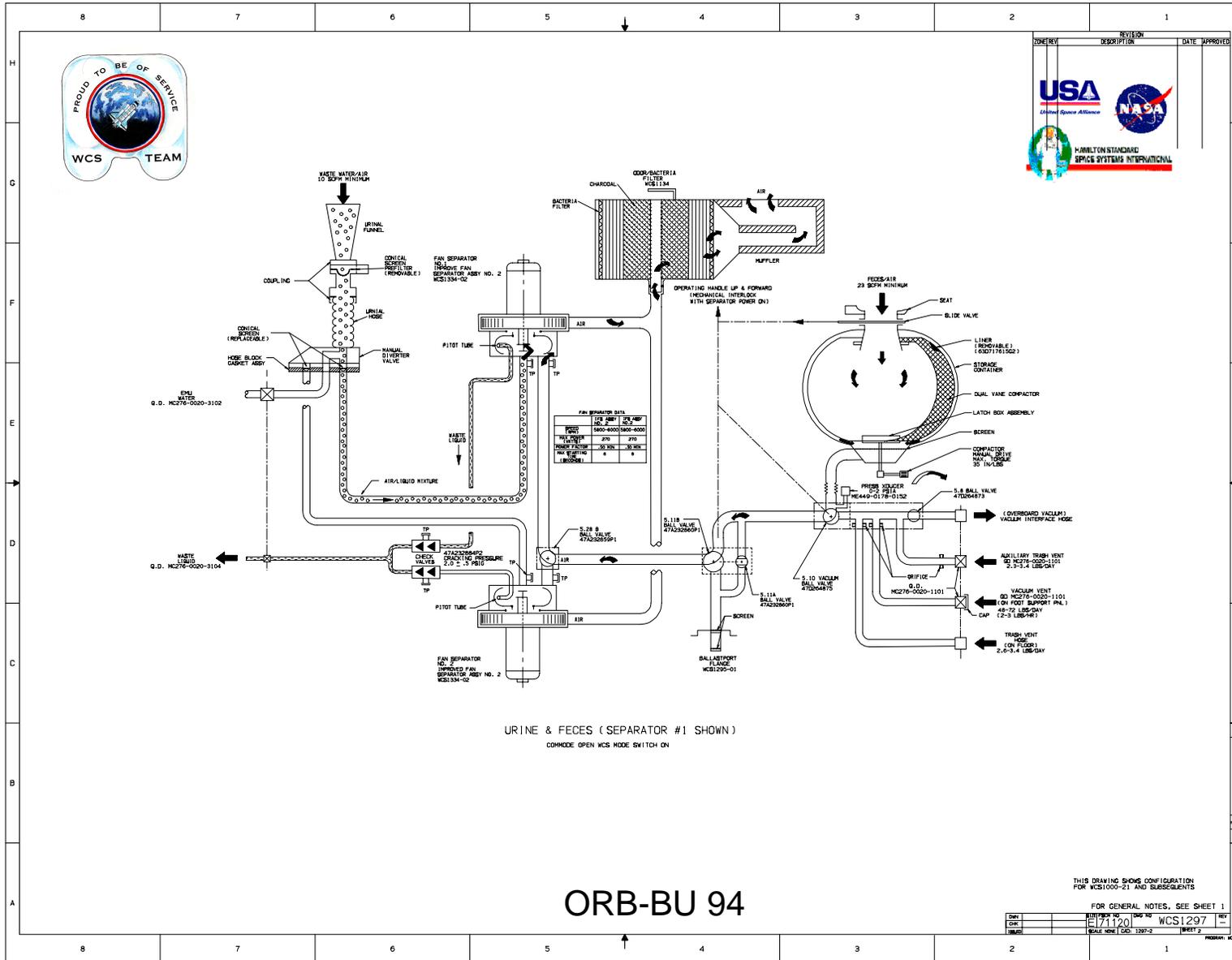
Organization/Date:  
Orbiter/02-14-02**Orbiter Provided Mission Kit Changes:**

- MV0075A Airlock Panel Mods/Wire Harness Installation
- MV0428A MADS Insulation Blanket Modification
- MV0520A Radiator Shielding & Isolation Modification
- MV0544A PRSD Tank Set 3 Blanket Modification
- MV0549A PLB Floodlight Lamp Assy & FEA Upgrade
- MV0566A PRSD Tank Set 5 Fairing Replacement
- MV0617A EVA Slidewire Relocation
- MV0828A Airlock Fan Package Adapter Plate
- MV0846A Non-functional Acoustic Sensor Deletion
- MV0874A Wireless Video System Support Hardware

	Presenter:
	Organization/Date: Orbiter/02-14-02

# SPECIAL TOPICS BACKUP

# WCS CHECK VALVE FAILURE WCS SCHEMATIC



# WCS CHECK VALVE FAILURE CHECK VALVE DATA

Check Valve Assembly History, 2-9-02							
S/N	Lot	Current Location	Side 1 Missions	Side 2 Missions	Total Missions'	Visual Inspection	Bubble Leak Test
003	A	HSMS	8	9	17	Pass	
005	A	HSMS	1	16	17	Pass	
006	A	Unit 123 (Side 2, STS-111)	14	0	14	Pass	Pass
008	B	Unit 124 (Side 1, STS-109)	5	11	16		Pass
009	C	Eng Unit	5	8	13		
011	B	HSMS	10	2	12	Pass	
013	C	Unit 415 HSMS	7	9	16		
014	C	Unit 500 (Side 2, STS-110)	0	17	17		Pass
018	D	HSMS	2	0	2	Pass	
019	D	Unit 123 (Side 1, STS-111)	2	2	4	Pass	Pass
020	D	HSMS	2	0	2	Pass	
021	E	Unit 415 HSMS	2	0	2	Failure**	
022	E	Unit 124 (Side 2, STS-109)	0	0	0		Pass***
023	E	Unit 500 (Side 1, STS-110)	1	0	1		Pass
*Missions based on HSMS records, CVs used prior to STS-26 unknown mission data							
**Replaced seat and re-inspected							
***Vendor Test							

# STS-108 POST-LANDING DRAG CHUTE DAMAGE OBSERVED

Presenter:

Organization/Date:  
Orbiter/02-14-02

**80 Lb Cotton Tape Break Ties**



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# STS-108 POST-LANDING DRAG CHUTE DAMAGE OBSERVED

Presenter:

Organization/Date:  
Orbiter/02-14-02

## Other causes of ribbon damage investigated determined to be highly unlikely

- Possible entanglement with 80 lb cotton tape break line ties in bag during canopy deployment
  - 300 lb nylon chute ribbon broken, inspection of break ties revealed no signs of unusual damage
- Possible contact with Teflon flaps in deployment bag during canopy deployment
  - Inspection of flaps revealed no mechanism for snagging
- Review of packing process at PRF indicates damage caused from packing is unlikely
  - First press of canopy does not occur until location of damaged area is well into the pack and compartment contains nothing to snag on
  - Detailed inspection process in place during packing procedure

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**STS-108 POST-LANDING DRAG  
CHUTE DAMAGE OBSERVED**

Presenter:

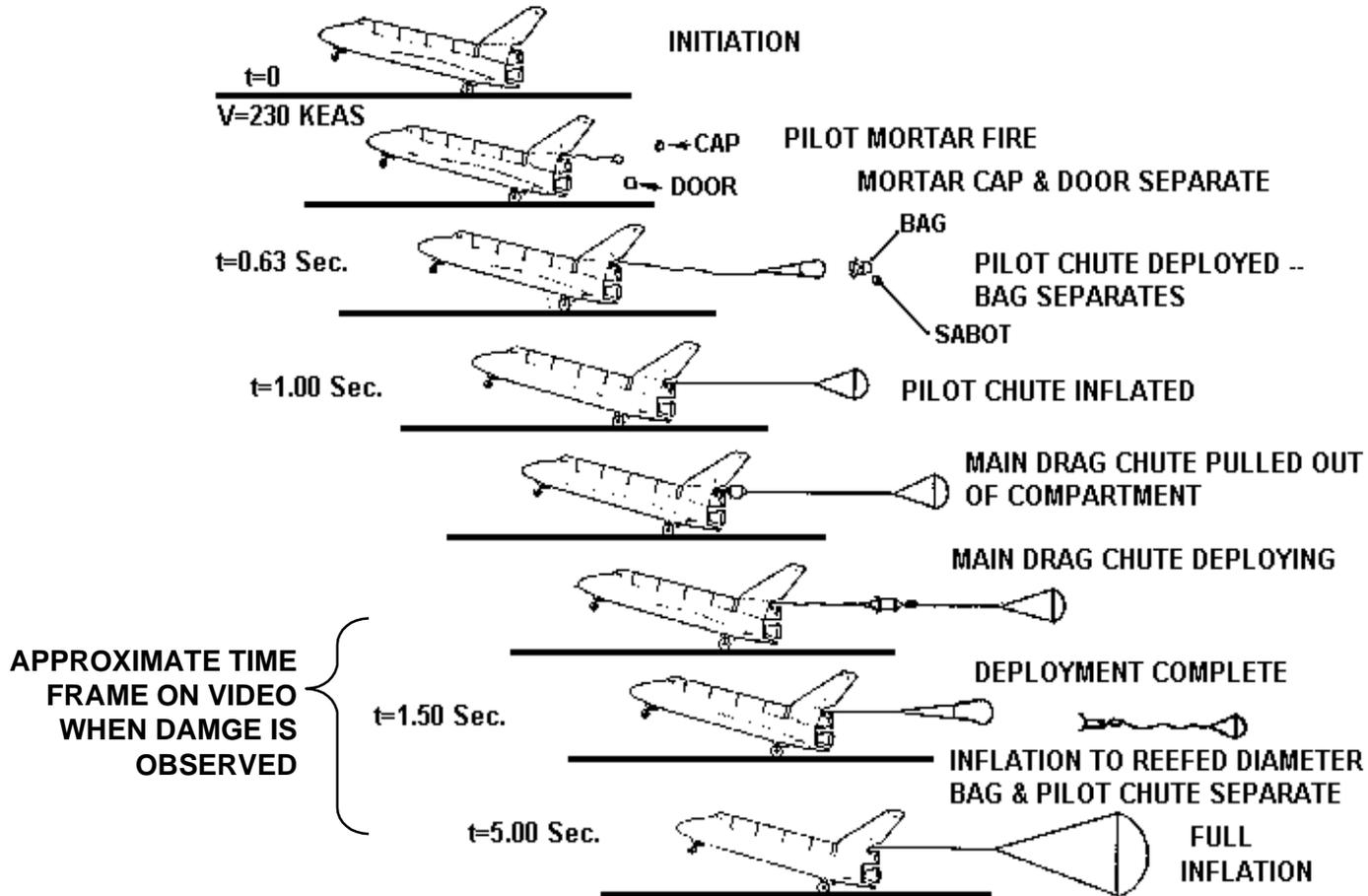
Organization/Date:  
Orbiter/02-14-02

- Drag Chute reuse implementation plan started April 1994
- Drag chute is refurbished after every mission for reuse on vehicle with a certification limit of 15 uses (14 repacks)
  - STS-108 Chute 3<sup>rd</sup> use, 2<sup>nd</sup> repack at PRF
  - 2 fleet leaders @ 6 flights (5 refurbishments)

# STS-108 POST-LANDING DRAG CHUTE DAMAGE OBSERVED

Presenter:

Organization/Date:  
Orbiter/02-14-02



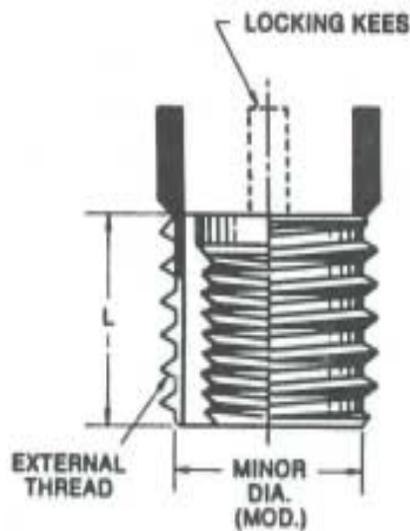
TIMES APPROXIMATE  
DEPENDS ON REEFING PARAMETERS

53pm

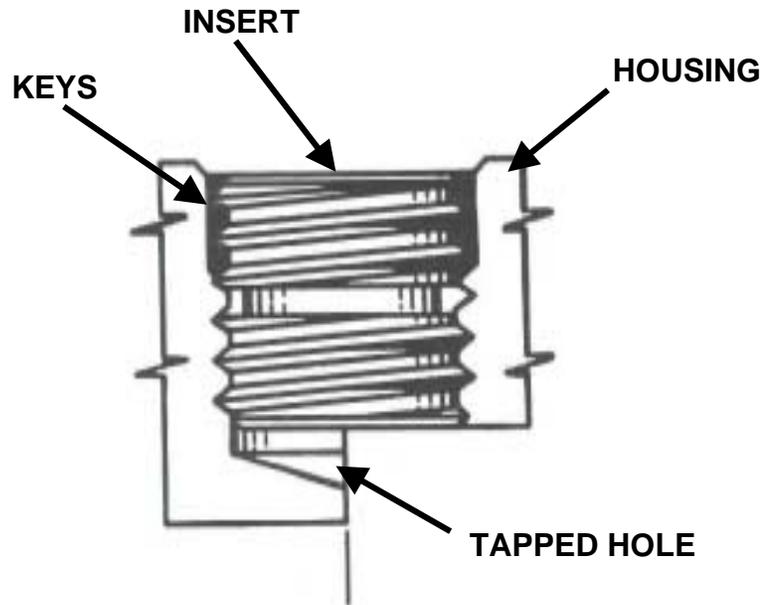
# HYDRAULIC MAIN PUMP PORT CAP BOLTS

Presenter:

Organization/Date:  
Orbiter/02-14-02



UN-  
INSTALLED  
INSERT



INSTALLED  
INSERT

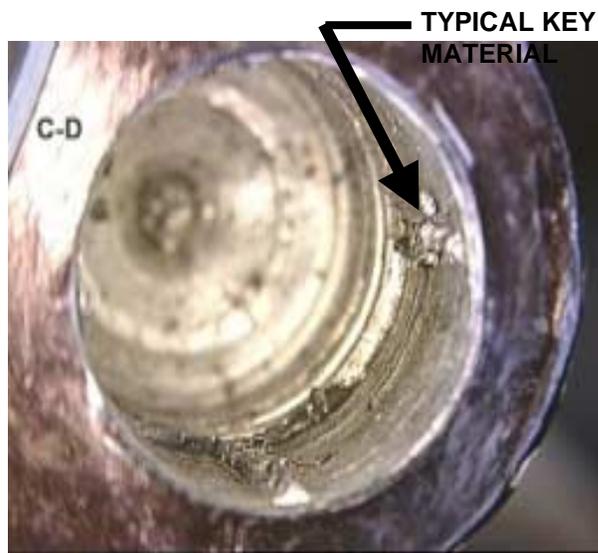
## UN-INSTALLED AND INSTALLED PICTORIALS OF KEY LOCKED INSERT

# HYDRAULIC MAIN PUMP PORT CAP BOLTS

Presenter:

Organization/Date:  
Orbiter/02-14-02

- Pull tests performed on 3 inserts of engineering test unit pump showed that threads in the housing completely sheared out of the hole leaving four keys behind:
  - 10,925 lbs
  - 11,340 lbs
  - 11,586 lbs



STRIPPED HOLE WITH KEY MATERIAL



INSTALLED INSERT

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<h1>HYDRAULIC MAIN PUMP PORT CAP BOLTS</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Build Records and Flight History of the OV-102 Pumps:

SYSTEM	S/N	ORIGINAL MANUFACTURE DATE	PORT CAP BOLTS	DATA PACK REVIEW	HEAT TREAT LOT ID	MATERIAL CERTIFICATION
SYS 1	193659	1989	ALL DFL	FRONT HOUSING REPLACED IN 1999. NO RECORD OF BOLT REPLACEMENT . FRONT HOUSING HAS ONE OVERSIZED INSERT AND FIVE CLOCKED INSERTS	UNKNOWN	NO DATA
SYS 2	152260	1975	ALL DFL	DATA PACK INDICATES NO FRONT HOUSING OR PORT CAP BOLT REPLACEMENT.	H125-S74	SAME LOT NUMBER AS PULL OUT TEST UNIT
SYS 3	192367	1982	ALL DFL	DATA PACK INDICATES NO FRONT HOUSING OR PORT CAP BOLT REPLACEMENT	H708-S77	TENSILE STRENGTH 33.3 KSI PER HEAT TREAT CERT DATA

- All three pumps were installed this flow to incorporate EDV solenoid wire harness modification (MCR 18806)
- OV-102 system 2 and 3 pumps have flown 19 and 14 flights respectively since original build
- This will be the first flight of the OV-102 system 1 pump since housing replacement

<h1>HYDRAULIC MAIN PUMP PORT CAP BOLTS</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Heat Treat Identification Numbers for Pumps at Abex and Spares:

SYSTEM	S/N	BOLTS	HEAT TREAT LOT	
SPARE	192321	MIXED		
ABEX	192323	ALL PASSIVATED	CA07809	
ABEX	152273	ALL DFL	NOT MARKED	
ABEX	193657	ALL DFL	CA07309	
ABEX (-0009 QUAL)	152271	ALL DFL	CA08239	
ABEX (ETU)	152263	ALL DFL	NOT MARKED	
ABEX (ETU)	152256	ALL PASSIVATED	CA07279	
HB ETU	152255	MIXED	H125-S74	PULLED OUT AT 10,900 LB

## Cast Housing Material Certification Data:

HEAT NO.	# PIECES	YEAR	TENSILE STRENGTH	SPEC
H708-S77	18 PCS	1977	33.3 KSI	MIL-A-21180C CL 11
H1005-S81#1	12 PCS	1981	42.5-43.3 KSI	MIL-A-21180 CL 2
H1130-S82#1	35 PCS	1982	41.7-43.9 KSI	MIL-A-21180 CL 2
H224-S84#1	50 PCS	1984	41.2 KSI KSI	MIL-A-21180 CL 2
CA08239	12 PCS	1999	42.8 KSI	MIL-A-21180 CL 2

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<h1>INVESTIGATION OF DSC TRANSISTOR FAILURES</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Results of PRACA Search (Page 1 of 2)

CAR	Date	Part NAME	P/N	S/N	Trans	MFG/LDC	Failure	Findings	Comments
A5122*	10/1/1976	CVRD	MC450-0034-0027	64	NS	NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)		Similar Failure/Action tracked on A5124
A5123*	10/1/1976	CVRD	MC450-0034-0027	70	Q503	Raytheon/NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)	Low reverse gain	Part did not fail spec MIL-S-19500/391. Inverse beta not specified in spec.
A5124*	9/22/1976	CVRD	MC450-0034-0027	95	NS	NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)		Similar Failure/Action tracked on A5123
A5125*	10/1/1976	CVRD	MC450-0034-0006	10	Q504	NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)		Similar Failure/Action tracked on A5123
A5127*	10/1/1976	CVRD	MC450-0034-0015	3	NS	NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)		Similar Failure/Action tracked on A5124
A5128*	10/1/1976	CVRD	MC450-0034-0027	54	NS	NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)		Similar Failure/Action tracked on A5124
A5782*	1/3/1977	CVDA	MC450-0049-0001	8	Q904	NS	Ripple requirement out of spec (ATP Paragraph 4.3)	Low reverse gain	Part did not fail spec MIL-S-19500/391. Inverse beta not specified in spec.
A5785*	1/3/1977	CVRD	MC450-0034-0038	15	Q503,Q504	NS	Ripple requirement out of spec (ATP Paragraph 4.2.6)		Similar Failure/Action tracked on A5782
A7937*	2/1/1977	CVDA	MC450-0049-0001	9	Q903	NS	output resistance out of spec (ATP Paragraph 4.2.4)	Low reverse gain	Part met all parameters of the procurement spec.
AB1110*	2/15/1978	CVRD	MC450-0034-0022	128A	NA	NA	Out of spec limits. FTP limit is +/- 20 mvdc	Categorized as no failure. Four gain calibration resistors were changed to achieve calibration in the affected channels.	ATP limits of +/- 50 mvdc is the fail/pass criteria on returned hardware. "Resistor not available for further evaluation." This CAR is excluded from failure history (i.e., not a transistor problem).

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<h1>INVESTIGATION OF DSC TRANSISTOR FAILURES</h1>	Presenter:
	Organization/Date: Orbiter/02-14-02

## Results of PRACA Search (Page 2 of 2)

CAR	Date	Part NAME	P/N	S/N	Trans	MFG/LDC	Failure	Findings	Comments
AB1102	1/9/1978	CVRD	MC450-0034-0029	120A	Q504	Raytheon /7612	Out of spec limits. FTP limit is +/- 20 millivolts	Part not available for test.	Transferred to AB1110. Recreation of the problem was unsuccessful, the part was removed. Suspect test equipment.
AB1103	1/10/1978	ABA	MC473-0110-0017	44A	Q503,Q504	Raytheon /7525	Out of spec limits. FTP limit is +/- 20 millivolts	Parts not available for test.	Same as AB1103
AB9258	4/13/1981	CVRD	MC450-0034-0053	5	Q503	Raytheon /7931	Test program revealed a short circuit.	Broken emitter bond wire (microphotographs). Electrical tests were performed (VEB=open and VCE=open).	No Further analysis performed. Categorized as random failure.
AD0585	12/4/1985	CVDA	MC450-0049-0001	40A	Q904	Raytheon /7831	All outputs exceeded the 100 ohm requirement.	Electrical tests OK on transistor, except for excess switching time.	Spec specifies toff=30 nanoseconds max. Transistor Q904 toff was 80 nanoseconds.
KP0150	6/20/1996	DSC	MC450-0034-0043	123A	Q503,Q504	CRP/7525	At PLMD, OV-103 output channels read low .		Q503 - Failed curve tracer and PIND testing. Found high concentration of Chlorine. Q504 - Awaiting DPA, did not fail.
92RF06	10/19/2000	CVRD	MC450-0034-0022	95A	Q503,Q504	CRP/7525	STS-92, DSC OM2 card 22 failed causing 4 measurements to go off scale low at -75F.	Intermetallics	Q503 - Failed curve tracer and PIND testing. Found Chlorine contents. Q504 - Failed curve tracer and PIND testing. Found high concentration of Silicon in Aluminum.
KB4564	9/5/2001	ABA	MC473-0110-0008	165A	Q701	CRP/7525	At KSC, OV102, excitation output voltage out of spec.	Intermetallics	Failed curve tracer, PIND testing not performed. Found Chlorine contents.

<b>INVESTIGATION OF DSC TRANSISTOR FAILURES</b>	Presenter:  Organization/Date: Orbiter/02-14-02
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**OV-102 Hardware With Confirmed or Possible Usage  
of Suspect Raytheon Transistors (Page 1 of 3)**

LRU NAME	LRU P/N	TRANS MFG NO.	Qty per LRU	102 ORB	LRU S/N	TRANSISTOR LOT NO.	FSCM (if avail)	NOTES:
SMK DETEC SUBSYS	MC431-0127-0103	QPL	1	YES	55296000020	NOT LISTED		QTY 4 REPLACES MC431-0127-0010
SMK DETEC SUBSYS	MC431-0127-0103	QPL	1	YES	55296000022	NOT LISTED		
SMK DETEC SUBSYS	MC431-0127-0103	QPL	1	YES	55296000028	NOT LISTED		
SMK DETEC SUBSYS	MC431-0127-0103	QPL	1	YES	55296000030	NOT LISTED		
SDS	MC431-0127-1103	QPL	1	YES	55296000031	NOT LISTED		
SDS	MC431-0127-1103	QPL	1	YES	55296000035	NOT LISTED		
SDS	MC431-0127-1103	QPL	1	YES	55296000043	NOT LISTED		
SDS	MC431-0127-1103	QPL	1	YES	55296000050	NOT LISTED		RAYTHEON TEST # 19500-7822
CONT PRESS COND	MC449-0185-0021		2	YES	02750000014	NO ADP?		
CONV VARIABL RES	MC450-0034-0006	07933	2	YES	0874800044A	7831	07933	
CONV VARIABL RES	MC450-0034-0021	07933	2	YES	08748000029	7525		
CONV VARIABL RES	MC450-0034-0021	07933	2	YES	0874800021A	7525		
CONV VARIABL RES	MC450-0034-0021	07933	2	YES	0874800023A	7525		
CONV VARIABL RES	MC450-0034-0021	07933	2	YES	0874800038A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800076A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800084A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800088A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800090A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800093A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800114A	NOT LISTED		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800116A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800123A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800124A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800215A	7831	07933	
CNVTR VARIABL RES TO D	MC450-0034-0022	07933	2	YES	0874800217A	7831	07933	
CONV VARIABL RES	MC450-0034-0027	QPL	2	YES	0874800101A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800036A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800037A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800040A	7525		

<b>INVESTIGATION OF DSC TRANSISTOR FAILURES</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**OV-102 Hardware With Confirmed or Possible Usage  
of Suspect Raytheon Transistors (Page 2 of 3)**

LRU NAME	LRU P/N	TRANS MFG NO.	Qty per LRU	102 ORB	LRU S/N	TRANSISTOR LOT NO.	FSCM (if avail)	NOTES:
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800043A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800047A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800058A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800061A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800072A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800100A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800102A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800106A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800107A	7525		
CVRD CORD	MC450-0034-0029	07933	2	YES	0874800109A	7525		
CONV VARIABL RES	MC450-0034-0030	07933	2	YES	08748000031A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0031	07933	2	YES	0874800016A	NOT LISTED		
CONV VARIABL RES	MC450-0034-0038	QPL	2	YES	0874800013A	7525		
CONV VARIABL RES	MC450-0034-0038	QPL	2	YES	0874800014A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0039	07933	2	YES	0874800008A	7831	07933	
CNVTR VARIABL RES TO D	MC450-0034-0042	07933	2	YES	0874800004A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0042	07933	2	YES	0874800006A	7525		
CONV VARIABL RES	MC450-0034-0043	07933	2	YES	0874800029A	7525		
CONV VARIABL RES	MC450-0034-0043	07933	2	YES	0874800039A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0047	07933	2	YES	0874800007A	7525		
CONV VARIABL RES	MC450-0034-0048	07933	2	YES	08748000003A	7525		
CONV VARIABL RES	MC450-0034-0048	07933	2	YES	08748000004A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0049	07933	2	YES	0874800002A	7525		
CNVTR VARIABL RES TO D	MC450-0034-0049	07933	2	YES	0874800028A	NOT LISTED		
CNVTR VARIABL RES TO D	MC450-0034-0049	07933	2	YES	0874800029A	NOT LISTED		
CONV VOLT AC-DC	MC450-0037-0001	07933	2	YES	0874800020A	7525		
CONV VOLT AC-DC	MC450-0037-0001	07933	2	YES	0874800021A	7525		
DUAL PWR BATTERY CHR	MC461-0032-0003	QPL	4	YES	19623982008	7831(1)	07933	qty 1 checking with eng.
DC AMPLR BFFR	MC473-0110-0002	07933	2	YES	0874800045A	7525		



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**OV-102 Hardware With Confirmed or Possible Usage  
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LRU NAME	LRU P/N	TRANS MFG NO.	Qty per LRU	102 ORB	LRU S/N	TRANSISTOR LOT NO.	FSCM (if avail)	NOTES:
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800122A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800124A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800128A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800131A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800147A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800160A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800161A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800165A	7525		
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800178A	7602(2)7525(1)		Q503, Q504 = 7602, Q701 = 7525
DC AMPLR BFFR	MC473-0110-0008	07933	3	YES	0874800431A	7831	07933	
DC AMPLR BFFR	MC473-0110-0012	07933	2	YES	0874800014A	7612 & 7525		Q503 = 7612, Q504 = 7525
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800031A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800041A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800042A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800043A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800051A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800054A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800055A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800057A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800058A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800063A	7525		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800096A	NOT LISTED		
DC AMPLR BFFR	MC473-0110-0017	07933	2	YES	0874800105A	7525		
DC AMPLR BFFR	MC473-0110-0020	07933	2	YES	0874800029A	7525		
DC AMPLR BFFR	MC473-0110-0020	07933	2	YES	0874800031A	7525		
DC AMPLR BFFR	MC473-0110-0020	07933	2	YES	0874800033A	7525		
DC AMPLR BFFR	MC473-0110-0020	07933	2	YES	0874800036A	7525		
DC AMPLR BFFR	MC473-0110-0020	07933	2	YES	0874800037A	7525		
CHASSIS MOTH BRD	MC476-0147-3001	07933	2	YES	08748000031	NOT LISTED		
CHASSIS MOTH BRD	MC476-0147-3001	07933	2		08748000042	NO ADP?		
CHASSIS MOTH BRD	MC476-0147-3001	07933	2	YES	08748000053	NOT LISTED		
CHASSIS MOTH BRD	MC476-0147-3001	07933	2	YES	08748000059	7927 & 7831	07933	
CHASSIS MOTH BRD	MC476-0147-3001	07933	2	YES	08748000073	NOT LISTED		
PSI	MC495-0012-0004	QPL	1	YES	8384300068S	NOT LISTED		
PSI	MC495-0012-0004	QPL	1	YES	8384300M Z35	NO ADP?		
OMS ENGINE	MC621-0009-0103	QPL	16			NOT LISTED		PNO MC621-0009-0301?? Checking.

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## OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 1 of 7)

Line #	Measurement #	Nomenclature	Crit	Location	C&W/SM	SSM Comments
	B55V1604C	LH VOLTAGE IGN PIC CAP B	1R3			LCC 2 of 2, monitored by RSLs
	B55V2604C	RH VOLTAGE IGN PIC CAP B	1R3			LCC 2 of 2, monitored by RSLs
241	E41T2150A	ME-2 CONTROLLER PS TEMP	1R3			
225	E41T2152A	ME-2 OPOV LOX SUPPLY LINE TEMP #2	1R3	Aft Bay 5		
228	E41T2154A	ME-2 MFV DOWNSTREAM TEMP #2	1R3	Aft Bay 5		
265	E41T3150A	ME-3 CONTROLLER PS TEMPERATURE	1R3	Aft Bay 6		
285	E41T3152A	ME-3 OPOV LOX SUPPLY LINE TEMP #2	1R3	Aft Bay 6		
288	E41T3154A	ME-3 MFV DOWNSTREAM TEMP #2	1R3	Aft Bay 6		
227	T41T1755A	ET-LO2 ULLAGE TEMP XT396.7	3/3			Engineering use loading parameter; no impact if lost
137	V09T1008A	LWR CL X582 FR OTR WEB TEMP	3/3			
140	V09T1010A	SIDE X582 FR OTR CAP TEMP	3/3			
57	V09T1012A	FWD-FUS LT BL TEMP AT 480	3/3			
58	V09T1016A	M FUS BTM PORT BL TEMP X620	3/3			
15	V09T1020A	FWD RCS UPR SKIN TEMP	3/3			
13	V09T1510A	RH FWD FUS RCS MOD SKIN T DSC OF4	3/3			One of three measurements called out in the LCC, section 33, Operational Instrumentation
14	V09T1514A	LH FWD FUS RCS MOD SKIN TEMP	3/3			
138	V09T1524A	FWD FUS UPPER SKIN CL TEMP 2	3/3			
139	V09T1624A	FWD FUS LOWER SKIN BOT CL TEMP	3/3			
59	V34T1102A	M-FUS LT BL TEMP AT 650	3/3			
60	V34T1128A	L UPR MID 582 FR	3/3			
234	V41P1254A	MPS E2 REG A HE OUTLET PRESS	1R3	FWD Bay 1	WLTSM, W	Required for launch to verify reg health; C&W
35	V41P1354A	MPS E3 REG A HE OUTLET PRESS	1R3	FWD Bay 1	WLTSM, W	Required for launch to verify reg health; C&W
294	V41P1354A	MPS E3 REG A HE OUTLET PRESS	1R3	Aft Bay 6	WLTSM, W	Required for launch to verify reg health; C&W
299	V41P1360A	MPS E3 GH2 PRESS OUTLET PRESS	1R3			Cue for failed SSME behind a data path failure; C&W
307	V41P1360A	MPS E3 GH2 PRESS OUTLET PRESS	1R3			Cue for failed SSME behind a data path failure; C&W
237	V41P1490A	MPS GH2 PRESSURIZATION DISC PRESS	1R2			Cue for defining an ET leak vs GH2 press system blockage
233	V41P1533C	MPS LO2 17IN FEED MANF DISC PRESS	3/3		WLTSM, W	C&W: Only invoked if multiple dump failure (>6) occur
229	V41T1231C	MPS E2 LO2 INLET TEMP	3/3			Used only for prelaunch start box; 2 of 3 LCC w/ 1131C & 1331C
226	V41T1261A	MPS E2 GH2 PRESS OUTLET TEMP	3/3			Used only for post MECO File IX calculations
289	V41T1331C	MPS E3 LO2 INLET TEMP	3/3			Used only for prelaunch start box; 2 of 3 LCC w/ 1131C & 1231C
286	V41T1361A	MPS E3 GH2 PRESS OUTLET TEMP	3/3			Used only for post MECO File IX calculations
230	V41T1527A	MPS LO2 17IN FEED MANF DISC TEMP B	3/3			Used for geyser detection prelaunch; redundant to 1528A
290	V41T1528A	MPS LO2 17IN FEED MANF DISC TEMP A	3/3			Used for geyser detection prelaunch; redundant to 1527A
17	V42P1112C//V42P1112C*	RCS FWD HE OX TANK PRESS-2	2R/3			LCC 1 of 2, degraded leak detection capability and PVT accuracy
21	V42P1113C	RCS FWD HE FU TANK PRESS-1	2R/3		WLTSM	LCC 1 of 2, degraded leak detection capability and PVT accuracy
22	V42P1115C	RCS FWD OX TANK ULLAGE PRESS	2R/3		WLTSM, W	LCC 1 of 2, degraded leak detection capability and PVT accuracy
19	V42P1212C	RCS-FWD OX MANF PRESS-1	2R/3			LCC 1 of 2, degraded leak detection capability and PVT accuracy
18	V42P1310C//V42P1310C*	RCS FWD FU TANK OUT PRESS	2R/3			LCC 1 of 2, degraded leak detection capability and PVT accuracy
23	V42P1312C	RCS-FWD FU MANF PRESS-1	2R/3			LCC 1 of 2, degraded leak detection capability and PVT accuracy
25	V42P1541A	RCS-FWD THRUST CHMBR PRESS-F1F	1R/3			
78	V42P1543A	RCS-FWD THRUST CHMBR PRESS-F3F	1R/3			
26	V42P1544A	RCS-FWD THRUST CHMBR PRESS-F1L	1R/3			
79	V42P1546A	RCS-FWD THRUST CHMBR PRESS-F3L	1R/3			
27	V42P1548A	RCS-FWD THRUST CHMBR PRESS-F1U	1R/3			
80	V42P1550A	RCS-FWD THRUST CHMBR PRESS-F3U	1R/3			
28	V42P1551A	RCS-FWD THRUST CHMBR PRESS-F1D	1R/3			
77	V42P1553A	RCS FWD THRUST CHMBR PRESS-F3D	1R/3			
	V42P2316C	RCS-L AFT FU MANF PRESS 3	2R/3			LCC 1 of 2, degraded leak detection capability and PVT accuracy
	V42P3314C	RCS-R AFT FU MANF PRESS 2	2R/3			LCC 1 of 2, degraded leak detection capability and PVT accuracy



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## OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 2 of 7)

Line #	Measurement #	Nomenclature	Crit	Location	C&W/SM	SSM Comments
9	V42T1502C	RCS-FWD FU THRUST INJ TEMP-F1F	1R3			
5	V42T1503C	RCS-FWD OX THRUST INJ TEMP-F2F	1R3			
1	V42T1504C	RCS-FWD FU THRUST INJ TEMP-F2F	1R3			
81	V42T1506C	RCS-FWD FU THRUST INJ TEMP-F3F	1R3			
10	V42T1508C	RCS-FWD FU THRUST INJ TEMP-F1L	1R3			
6	V42T1509C	RCS-FWD OX THRUST INJ TEMP-F2R	1R3			
2	V42T1510C	RCS-FWD FU THRUST INJ TEMP-F2R	1R3			
82	V42T1512C	RCS-FWD FU THRUST INJ TEMP-F3L	1R3			
85	V42T1513C	RCS-FWD OX THRUST INJ TEMP-F4R	1R3			
89	V42T1514C	RCS-FWD FU THRUST INJ TEMP-F4R	1R3			
11	V42T1516C	RCS-FWD FU THRUST INJ TEMP-F4U	1R3			
7	V42T1517C	RCS-FWD OX THRUST INJ TEMP-F2U	1R3			
3	V42T1518C	RCS-FWD FU THRUST INJ TEMP-F2U	1R3			
83	V42T1520C	RCS-FWD FU THRUST INJ TEMP-F3U	1R3			
12	V42T1522C	RCS-FWD FU THRUST INJ TEMP-F1D	1R3			
8	V42T1523C	RCS-FWD OX THRUST INJ TEMP-F2D	1R3			
4	V42T1524C	RCS-FWD FU THRUST INJ TEMP-F2D	1R3			
84	V42T1526C	RCS-FWD FU THRUST INJ TEMP-F3D	1R3			
86	V42T1527C	RCS-FWD OX THRUST INJ TEMP-F4D	1R3			
90	V42T1528C	RCS-FWD FU THRUST INJ TEMP-F4D	1R3			
87	V42T1529C	RCS-FWD OX THRUST INJ TEMP-F5L	2/2			
91	V42T1530C	RCS-FWD FU THRUST INJ TEMP-F5L	2/2			
88	V42T1531C	RCS-FWD OX THRUST INJ TEMP-F5R	2/2			
92	V42T1532C	RCS-FWD FU THRUST INJ TEMP-F5R	2/2			
	V42T3204A	RCS-R AFT OX MANF TEMP-1 DSC OR1	3/3			
	V43T5216A	OMS-R POD OXDZR ENG INLET TEMP	3/3			LCC 1 of 3, Same card as V43T5641A
	V43T5315A	OMS-R POD FU TANK TEMP-LOWER	3/3			
	V43T5641A	OMS-R ENG OX VLV TEMP	3/3			LCC 1 of 3, Same card as V43T5216A
70	V45Q1505A	PRSD O2 TK 5 QUANTITY (MBK)	3/3			Qty can be calculated using Press & Temp
157	V45Q2105A//V76X0916E	PRSD H2 TK 1 QUANTITY	3/3		WLTSM//	Qty can be calculated using Press & Temp
135	V45T0182A	FCP NO 1 ALT PRODUCT H2O LINE TEMP	3/3			3 Redundant paths for water separation
134	V45T0213A	FUEL CELL NO 2 STACK INLET TEMP	3/3			One of three Fuel Cell Temperatur measurements
188	V45T0382A	FCP NO 3 ALT PRODUCT H2O LINE TEMP	3/3			3 Redundant paths for water separation
133	V45T0450A	H2O RELIEF LINE TEMP	3/3			3 Redundant paths for water separation
192	V45T0456A	FCP H2O RELIEF NOZZLE TEMP B	3/3			3 Redundant paths for water separation
143	V45T1301A	PRSD O2 TK 3 FLUID TEMP (MBK)	3/3			One of three tank temperature measurements
						One of three tank temperature measurements. Loss of meas will not activate SM or C&W alarms, but it would mask a real failure. On board meter back up
141	V45T1309A	PRSD O2 TK 3 HTR ASSY 2 TEMP(MBK)	3/3		SM, C	One of three tank temperature measurements
144	V45T1401A	PRSD O2 TK 4 FLUID TEMP (MBK)	3/3			One of three tank temperature measurements
						One of three tank temperature measurements. Loss of meas will not activate SM or C&W alarms, but it would mask a real failure. On board meter back up
142	V45T1409A	PRSD O2 TK 4 HTR ASSY 2 TEMP(MBK)	3/3		SM, C	1 of 2 measurements needed per LCC. On board meter back up
177	V45V0300A	FUEL CELL NO 3 VOLTAGE	3/3		WLTSM	
239	V46P0241A	APU 2 TURBINE EXHAUST PRESSURE	3/3			Not Required - No LCC
235	V46P0252A	APU 2 GN2 BOTTLE PRESS	1R2	Aft Bay 5		LCC APU-13. Launch with instrumentation failure verified. No formal backup. Pre-Planned V46T0261A (on list), V46T0262A..
	V46P0300A	APU 3 FUEL TANK PRESSURE	3/3			LCC 1of 2. Backup V46T0305A. APU-01
	V46P0310A	APU 3 FUEL PUMP INLET PRESSURE	3/3			No impact, no LCC
297	V46P0320A	APU 3 GAS GENERATOR CHAMBER PRESS	1R2			LCC 1 of 1 - Mandatory for Flight APU-03. No Backup.
305	V46P0320A	APU 3 GAS GENERATOR CHAMBER PRESS	1R2			Duplicate of Above.
295	V46P0352A	APU 3 GN2 BOTTLE PRESS	1R2	Aft Bay 5		LCC APU-13. Launch with instrumentation failure verified. Pre-Planned V46T0361A, V46T0362A..
						LCC APU-11. Launch with instrumentation failure verified. No formal backup. Pre-Planned V46T0350A, V46T0354A, V46T0361A & V46T0362A.
	V46P0353A	APU-3 GEARBOX LUBE OIL OUT PRESS	3/3			
205	V46R0235A	APU 2 TURBINE SPEED	1R			LCC 1 of 1 - Mandatory for Flight APU-06. No Backup.

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## OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 3 of 7)

Line #	Measurement #	Nomenclature	Crit	Location	C&W/SM	SSM Comments
253	V46R0335A	APU 3 TURBINE SPEED	1R			LCC 1 of 1 - Mandatory for Flight APU-06. No Backup.
217	V46T0104A	APU 1 FUEL LINE TEMP NO 2	2R3			LCC 1 of 2. Backup V46T0108A. APU-02.
246	V46T0162A	APU 1 GEARBOX BEARING TEMP NO2	3I3			LCC 1 of 2. Backup V46T0161A. APU-12.
161	V46T0170A	APU 1 F/P DRN LN TEMP 2	3I3			LCC 1 of 2. Backup V46T0186A (on list). APU-15.
218	V46T0184A	APU 1 FUEL SERVICE LINE TEMP	3I3			LCC 1 of 2. Backup V46T0183A. APU-14.
277	V46T0186A	APU 1 FUEL PUMP DRAIN LINE TEMP 1	3I3			LCC 1 of 2. Backup V46T0170A (on list). APU-15.
273	V46T0204A	APU 2 FUEL LINE TEMP NO 2	2R3			LCC 1 of 2. Backup V46T0208A (on list). APU-02.
219	V46T0208A	APU 2 FUEL LINE TEMP NO 1	2R3			LCC 1 of 2. Backup V46T0204A (on list). APU-02.
187	V46T0212A	APU 2 FUEL PUMP DISCHARGE TEMP	3I3			LCC 1 of 3. Backups V46T0292A & V46T1272A. APU-18/APU-22
245	V46T0250A	APU 2 GEARBOX LUBE OIL RETURN TEMP	3I3		WL TSM, C	LCC 1 of 2. Backup V46T0254A (on list). APU-08/APU-09.
283	V46T0254A	APU 2 GEARBOX LUBE OIL OUT TEMP	3I3			LCC 1 of 2. Backup V46T0250A (on list). APU-08/APU-09.
247	V46T0261A	APU 2 GEARBOX BEARING TEMP NO1	3I3			LCC 1 of 2. Backup V46T0262A. APU-12.
220	V46T0283A	APU 2 FUEL TEST LINE TEMP 1	2R3			LCC 1 of 2. Backup V46T0284A (on list). APU-14.
274	V46T0284A	APU 2 FUEL SERVICE LINE TEMP	3I3			LCC 1 of 2. Backup V46T0283A (on list). APU-14.
278	V46T0286A	APU 2 FUEL PUMP DRAIN LINE TEMP 1	3I3			LCC 1 of 2. Backup V46T0270A. APU-15
275	V46T0308A	APU 3 FUEL LINE TEMP NO 1	2R3			LCC 1 of 2. Backup V46T0304A. APU-02.
284	V46T0328A	APU 3 FUEL LINE TEMP NO 3	2R3			LCC 1 of 2. Backup V46T1371A. APU-05
276	V46T0383A	APU 3 FUEL TEST LINE TEMP 1	2R3			LCC 1 of 2. Backup V46T0384A. APU-14.
221	V46T0386A	APU 3 FUEL PUMP DRAIN LINE TEMP 1	3I3			LCC 1 of 2. Backup V46T0370A. APU-15
164	V46T0392A	APU 3 FUEL PUMP TEMP	3I3			LCC 1 of 3. Backups V46T0312A & V46T1372A (on list). APU-18/APU-22.
189	V46T1171A	APU 1 GGVM FUEL SUPPLY LINE TEMP	3I3			LCC 1 of 2. Backup V46T0128A. APU-05.
185	V46T1175A	APU 1 ISO VALVE A TEMP 1	3I3			Not Required - No LCC
190	V46T1271A	APU 2 GGVM FUEL SUPPLY LINE TEMP	3I3			LCC 1 of 2. Backup V46T0228A. APU-05.
162	V46T1273A	APU 2 ISO VALVE B TEMP 1	3I3			Not Required - No LCC
186	V46T1274A	APU 2 ISO VALVE B TEMP 2	3I3			Not Required - No LCC
163	V46T1372A	APU 3 GGVM HEAT SINK TEMP	3I3			LCC 1 of 3. Backups V46T0312A & V46T0392A (on list). APU-18/APU-22
181	V51T0374A	NLG LH WHEEL TEMP	3I3			
182	V51T0474A	MLG RH OUTBD WHEEL TEMP	3I3			
183	V51T0574A	MLG LH OUTBD WHEEL TEMP	3I3			
73	V51V0510A//V76X4740E	LH BRAKE PEDAL XDCR NO 1-CMDR	3I3			
33	V51V0512A//V51V0512A*	LH BRAKE PEDAL XDCR NO 3-CMDR	3I3			
37	V51V0513A//V51V0513A*	LH BRAKE PEDAL XDCR NO 4-CMDR	3I3			
69	V51V0515A//V51V0515A*	RH BRAKE PEDAL XDCR NO 1-CMDR	3I3			
110	V51V0516A//V510516A*	RH BRAKE PEDAL XDCR NO 2-CMDR	3I3			
29	V51V0518A//V61X2375E	RH BRAKE PEDAL XDCR NO 4-CMDR	3I3			
75	V51V0536A	RH BRAKE PEDAL XDCR NO 2-PILOT	3I3			
309	V58P0104A	HYD SYS 1 H2O BLR GN2 REG OUTLET P	3I3			
	V58P0115A	HYDR SYS 1 SUPPLY PRESS B	3I3			LCC 1of 2 Backup Measurement V58P0116C
240	V58P0115A//V58P0115C	HYDR SYS 1 SUPPLY PRESS B	3I3			LCC 1of 2 Backup Measurement V58P0116C
236	V58P0214C	HYDR SYS 2 SUPPLY PRESS A	3I3		M, C	No LCC but is used for Caution and Warning
298	V58P0216C	HYDR SYS 2 SUPPLY PRESS C	3I3			LCC 1of 2 Backup Measurement V58P0215A
306	V58P0216C	HYDR SYS 2 SUPPLY PRESS C	3I3			Same as above
296	V58P0314C	HYDR SYS 3 SUPPLY PRESS A	3I3		M, C	No LCC but is used for Caution and Warning
238	V58P0316C	HYDR SYS 3 SUPPLY PRESS C	3I3			LCC 1of 2 Backup Measurement V58P00315A

<h1>INVESTIGATION OF DSC TRANSISTOR FAILURES</h1>	Presenter:  Organization/Date: Orbiter/02-14-02
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## OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 4 of 7)

Line #	Measurement #	Nomenclature	Crit	Location	C&W/SM	SSM Comments
300	V58P0337A	HYD SYS 3 CIRC PUMP PRESS	3/3	Aft Bay 6		LCC HYD-03 : Hydraulic Supply may be used as backup
308	V58P0337A	HYD SYS 3 CIRC PUMP PRESS	3/3	Aft Bay 6		LCC HYD-03 : Hydraulic Supply may be used as backup
47	V58T0126A	HYD SYS 1 NLG UPLK ACTR LOCK LN T	3/3			No LCC Violation
272	V58T0130A	HYD SYS 1 LH2 ET RET ACTR RTN LN T	3/3			No LCC Violation
214	V58T0169A	HYD SYS 1 BODY FLAP RTN LN T 1	3/3			No LCC Violation
213	V58T0222A	HYDR SYS 2 RETURN LINE TEMP	3/3			
242	V58T0269A	HYD SYS 2 BODY FLAP RTN LN T	3/3			
210	V58T0283A	HYD 2 LOX ET UMB RTN ACTR R LN T	3/3			
269	V58T0301A	HYD SYS 3 RSVR FLUID TEMP	3/3			No LCC
269	V58T0301A	HYD SYS 3 RSVR FLUID TEMP	3/3			
271	V58T0320A	HYDR SYS 3 FLUID HEATER OUT TEMP	3/3			
266	V58T0369A	HYD SYS 3 BODY FLAP RTN LN T	3/3			
262	V58T0383A	HYD 3 LOX ET UMB RTN ACTR R LN T	3/3			
216	V58T0384A	HYD SYS 3 RSB RTN LN T	3/3			
264	V58T0386A	HYD 3 LH2 ET UMB RTN ACTR R LN T	3/3			
46	V58T0423A	NLG STRUT ACTUATOR TEMP	3/3			
270	V58T0830A	HYDR SYS LH INBD ELVN ACTR TEMP	3/3			
215	V58T0883A	HYDR SYS 2 RETURN LINE TEMP	3/3			
244	V58T1131A	HYD SYS 1 ME1 INTFC RTN LN TEMP	3/3			
268	V58T1330A	HYD SYS 3 ME3 INTFC PRESS LN TEMP	3/3			
212	V58T1650A	BODY FLAP SEAL CAV DRAIN LN TEMP A	3/3			
263	V58T1651A	BODY FLAP SEAL CAV DRAIN LN TEMP B	3/3			
243	V58T2211A	HYD SYS 2 BOOTSTRAP ACCUM TEMP	3/3			
209	V58T2240A	HYD SYS 2 SSME ACCUMULATOR TEMP	3/3			
267	V58T2311A	HYD SYS 3 BOOTSTRAP ACCUM TEMP	3/3			
261	V58T2340A	HYD SYS 3 SSME ACCUMULATOR TEMP	3/3			
62	V61P2115A	O2 REG PRESS SYS 1	3/3			
61	V61P2307A	SYS 1 N2/H2O TNK PRESS	3/3			
71	V61P2405A	CABIN PRESS	1R3	FWD Bay 2	M, W	
32	V61R2105A	SYS 1 O2 FLOWRATE	3/3			
38	V61R2553A	SYS 1 N2 FLOWRATE	3/3		WLTSM, W	
170	V61T2406A	SYS 1 N2 TANK 1 TEMP	3/3			
172	V61T2408A	SYS 2 N2 TANK 1 TEMP	3/3			
184	V61T2422A	SYS 2 N2 TANK 3 TEMP	3/3			
165	V61T2424A	SYS 1 N2 TANK 3 TEMP	3/3			
260	V61T2425A	SYS 1 N2 TANK 4 TEMP	3/3			
93	V61T2624A	LOOP 1 AVNS BAY 1 H2O OUTLET TEMP	3/3			
100	V61T2625A	LOOP 2 AVNS BAY 1 H2O OUTLET TEMP	3/3			
53	V61T2627A	LOOP 1 AVNS BAY 2 H2O OUTLET TEMP	3/3			
96	V61T2628A	LOOP 2 AVNS BAY 2 H2O OUTLET TEMP	3/3			
54	V61T2630A	LOOP 1 AVNS BAY 3A H2O OUTLET TEMP	3/3			
97	V61T2631A	LOOP 2 AVNS BAY 3A H2O OUTLET TEMP	3/3			
76	V61T2645A	AVNS BAY 1 OUTLET AIR TEMP	3/3		WLTSM, C	
160	V61T2650A	AVNS BAY 2 OUTLET AIR TEMP	3/3		WLTSM, C	
34	V61T2661A	AVNS BAY 3 OUTLET AIR TEMP	3/3		WLTSM, C	
49	V61T2723A	H2O LOOP 2 INTCHGR INLET LINE TEMP	3/3			
50	V61T2743A	H2O LOOP 1 INTCHGR INLET LINE TEMP	3/3			
109	V61X2377E//V76V4902A	O2/N2 CNTLR VLV-SYS 2 OPEN	3/3			
99	V62T0418A	SUPPLY H2O DUMP LINE TEMP	3/3			

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## OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 5 of 7)

Line #	Measurement #	Nomenclature	Crit	Location	C&W/SM	SSM Comments
94	V62T0556A	VACUUM VENT LINE TEMP	3/3			
56	V62T0578A	URINE DUMP LINE 1 TEMP	3/3			
112	V63R1100A	FCL 1 INTERCHANGER FLOW RATE	3/3		WLTSM, C	
127	V63R1300A	FCL 2 INTERCHANGER FLOW RATE	3/3		WLTSM, C	
55	V63T1208A	FCL 1 RAD OUTLET TEMP	3/3			
98	V63T1408A	FCL 2 RAD OUTLET TEMP	3/3			
280	V63T1800A	FLASH EVAP TOPPING DUCT TEMP-HTR H	3/3			
223	V63T1810A	FLASH EVAP TOPPING DUCT TEMP-HTR F	3/3			
279	V63T1878A	FLASH EVAP TOPPING NOZ LH T-HTR I	3/3			
224	V63T1879A	FLASH EVAP TOPPING NOZ RH T-HTR G	3/3			
281	V63T1890A	FLASH EVAP HI LOAD NOZ TEMP-HTR C	3/3			
175	V63T1891A	A SUPPLY FES TOPPING H2O FDLN TEMP	3/3			
176	V63T1892A	A SUPPLY FES ACCUM H2O FDLN TEMP	3/3			
222	V63T1896A	B SUPPLY FES HI LOAD H2O FDLN TEMP	3/3			
63	V64P0102A	AIRLOCK DIFF PRESS NO 2-CABIN	3/3			
64	V64P0201A	EXTRA VEHICULAR LSS H2O SPLY PRESS	3/3		WLTSM	
51	V64T0130A	WALL TEMP A/L ON TUNNEL ADAPTOR	3/3			
52	V64T0131A	WALL TEMP A/L IN PAYLOAD	3/3			
166	V64T0134A	VESTIBULE TEMP 2 ZN 3 PORT	3/3			
174	V64T0136A	EXT A/L LWR BKHD TEMP	3/3			
117	V67X0110E	BIO-MED CHAN TMS SW POS	3/3			
131	V74T2497A	KU-BAND A/RADAR TRANSMITTER TEMP	2R2			
130	V74T2961A	KU-BAND COMM A/RADAR RECEIVER TEMP	2R2			
41	V74T2963A	KU-BAND COMM A/RADAR TEMP	2R2			
132	V74T2965A	KU-BAND COMM A/RADAR A-GIMBAL TEMP	2R2			
43	V74T2967A	KU-BAND COMM A/RADAR GYRO TEMP	2R2			
105	V75S1002E	PCM 2 FORMAT SELECT-GPC	3/3			
106	V75S1004E	PCM 2 FORMAT SELECT-PROGRAMMABLE	3/3			
153	V75S2236E	MTU NO 1 OSC SELECT	3/3			
154	V75S2237E	MTU NO 2 OSC SELECT	3/3			
72	V75T2517A	RCDR OPS 1 HEAD TEMPERATURE	3/3			
202	V75X2172E	BAY2 DSC	1R3			
197	V75X2174E	BAY4 DSC	1R3			
249	V75X2175E	BAY5 DSC	1R3			
313	V75X2176E	BAY6 DSC	1R3			
193	V75X2183E	MID 3 DSC (LH SIDE) SHELF 6	1R3			
65	V76V0120A	CONTROL BUS AB1 VOLTAGE	3/3			Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL AB1 Powered LRU Status.
66	V76V0121A	CONTROL BUS AB2 VOLTAGE	3/3			Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL AB2 Powered LRU Status.
67	V76V0122A	CONTROL BUS AB3 VOLTAGE	3/3			Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL AB3 Powered LRU Status.
179	V76V0200A	MAIN BUS B VOLTAGE	3/3		WLTSM	LCC EPDC-01. BU: FC2 Volts (not in list).
113	V76V0220A	CONTROL BUS BC1 VOLTAGE	3/3	FWD Bay 2		Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL BC1 Powered LRU Status.
114	V76V0221A	CONTROL BUS BC2 VOLTAGE	3/3	FWD Bay 2		Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL BC2 Powered LRU Status.
115	V76V0222A	CONTROL BUS BC3 VOLTAGE	3/3	FWD Bay 2		Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL BC3 Powered LRU Status.
180	V76V0230A	ESS BUS 2CA VOLTAGE	3/3		WLTSM	Not in LCC. BU: ESS 2CA Powered LRU Status.
149	V76V0320A	CONTROL BUS CA1 VOLTAGE	3/3			Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL CA1 Powered LRU Status.
150	V76V0321A	CONTROL BUS CA2 VOLTAGE	3/3			Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL CA2 Powered LRU Status.
151	V76V0322A	CONTROL BUS CA3 VOLTAGE	3/3			Not in LCC EPDC section; In MIL section. If Volts lost, 1 of 2 RPC indications required. BU: CNTL CA3 Powered LRU Status.
121	V76V0912A	KU BAND ANT A GLTN CAP VOLTS B	3/3			
31	V76V0921A	KU BAND ANT A BOLT CAP VOLTS A	3/3			

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**OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 6 of 7)**

Line #	Measurement #	Nomenclature	Crit	Location	C&W/SM	SSM Comments
101	V76V1600A	AC BUS 2 PHASE A VOLT	3/3		WLTSM	
102	V76V1601A	AC BUS 2 PHASE B VOLT	3/3		WLTSM	
103	V76V1602A	AC BUS 2 PHASE C VOLT	3/3		WLTSM	
145	V76V1700A	AC BUS 3 PHASE A VOLT	3/3		WLTSM	
146	V76V1701A	AC BUS 3 PHASE B VOLT	3/3		WLTSM	
147	V76V1702A	AC BUS 3 PHASE C VOLT	3/3		WLTSM	
68	V76V3071A	FWD PCA-1 VOLTAGE	3/3			
116	V76V3072A	FWD PCA-2 VOLTAGE	3/3			
152	V76V3073A	FWD PCA-3 VOLTAGE	3/3			
178	V76V3092A	AFT PCA-5 VOLTAGE	3/3			
302	V76V3093A	AFT PCA-6 VOLTAGE	3/3			
39	V76V4700A	AVN FEXT AV BAY 3A PYRO CAP VOLT	3/3			
111	V76V4736A	AVN FEXT AV BAY 1 PYRO CAP VOLT	3/3			
125	V76V4820A	NLG PYRO EXTEND ACTR-CAP VOLT-1	3/3			
128	V76V4830A	NLG EMER EXT PYRO A CAP VOLT	3/3			
	V76V4902A	LMG EMER EXT PYRO B CAP VOLT	3/3			
124	V76V7342A	PORT RMS FWD LCH BOLT CAP VOLTS B	3/3			
126	V76V7349A//V74E4082A	PORT RMS FWD LCH GLTN CAP VOLTS B	3/3		WLTSM	
159	V76V7359A	PORT RMS MID LCH BOLT CAP VOLTS B	3/3			
123	V76V7376A	PORT RMS AFT LCH BOLT CAP VOLTS B	3/3			
168	V78T9606A	SHELF 8 TOP HEAT SINK TEMP MADS	3/3			
167	V78T9607A	SHELF 8/7 BOTTOM HEAT SINK T MADS	3/3			

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**OV-102 Measurements Processed by DSCs With Confirmed or Possible Usage of Suspect Raytheon Transistors (Page 7 of 7)**

Addendum 1 to JANTXV2N3019 Transistor Investigation, OV-102					
Switch Scan Measurement Number: DSC Excitation Source Is Same As the Reference Measurement at Left	Nomenclature	Crit	Location	C&W/SM	SSM Comments
V76X4750E	AVN FEXT AV Bay 1 Pyro RTST	1R3	FWD Bay 2	No/No	
V76X4824E	NLG Pyro Extend ACTR-L/T -2	1R3	FWD Bay 2	No/No	
V76X4827E	NLG Pyro Extend ACTR-RTST -2	1R3	FWD Bay 2	No/No	
V76X4836E	NLG EMER EXT Pyro L/T -B	1R3	FWD Bay 2	No/No	
V76X4839E	NLG EMER EXT Pyro RTST -B	1R3	FWD Bay 2	No/No	
V76X4906E	LMG EMER EXT Pyro L/T -B	1R3	FWD Bay 2	No/No	
V76X4909E	LMG EMER EXT Pyro RTST -B	1R3	FWD Bay 2	No/No	
V76X4956E	RMG EMER EXT Pyro L/T -B	1R3	FWD Bay 2	No/No	
V76X4959E	RMG EMER EXT Pyro RTST -B	1R3	FWD Bay 2	No/No	
V76X6931E	ORB/ET FWD SEP Pyro L/T B	1R3	FWD Bay 2	No/No	
V76X6933E	ORB/ET FWD SEP Pyro RTST B	1R3	FWD Bay 2	No/No	
V67X0112E	Bio-Med Chan 1-PS SW POS	3/3	Bay 3A	No/No	
V67X0114E	Bio-Med Chan 1-Mid Deck L SW POS	3/3	Bay 3A	No/No	
V67X0116E	Bio-Med Chan 1-Mid Deck CTR SW POS	3/3	Bay 3A	No/No	
V67X0118E	Bio-Med Chan 1-Mid Deck R SW POS	3/3	Bay 3A	No/No	
V67X0120E	Bio-Med Chan 1-EVA 1 SW POS	3/3	Bay 3A	No/No	
V76X0919E	KU Band Ant A GLTN Pyro RTST B	1R3	Bay 3A	No/No	
V76X0927E	KU Band Ant A Bolt Pyro L/T B	1R3	Bay 3A	No/No	
V76X0932E	KU Band Ant A Bolt Pyro RTST B	1R3	Bay 3A	No/No	
V76X4720E	AVN FEXT AV Bay 2 Pyro L/T	1R3	Bay 3A	No/No	
V76X4730E	AVN FEXT AV Bay 2 Pyro RTST	1R3	Bay 3A	No/No	
V76X4823E	NLG Pyro Extend ACTR-L/T-1	1R3	Bay 3A	No/No	
V76X4826E	NLG Pyro Extend ACTR-RTST-1	1R3	Bay 3A	No/No	
V76X4835E	NLG EMER EXT Pyro L/T-A	1R3	Bay 3A	No/No	
V76X4838E	NLG EMER EXT Pyro RTST-A	1R3	Bay 3A	No/No	
V76X4905E	LMG EMER EXT Pyro L/T-A	1R3	Bay 3A	No/No	
V76X4908E	LMG EMER EXT Pyro RTST-A	1R3	Bay 3A	No/No	

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# OMS/RCS MR SUMMARY BACKUP

<b>OMS/RCS MR SUMMARY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

**PR Number      Part Name      Part Number      Serial      Date**

**LP05-16-0314      RCS Engine      MC467-0018-5001      624      10/06/00**

The ring grommet on the J2 connector of thruster s/n 624 has a tear located adjacent to pins 5 & 6. MR accepted to use as is, unrestricted. With no missing material or shape deformation, the ring grommet will maintain functional characteristics.

**LP05-16-0321      OMS Engine      MC621-0009-0301      110      08/01/00**

Inspection revealed a scratch with raised metal on the combustion chamber approximately 1-2 inches above the nozzle exit plane, and 45 deg CCW from the fuel torus inlet. Mold impressions documented the size of L = 0.150", W = 0.021", D = 0.001", H = 0.002". MR allowed polishing with 800 grit sandpaper with water to remove raised metal and blend sharp edges.

**LP05-16-0371      OMS Engine      MC621-0009-4007      116      05/10/01**

A nick was observed on the interior surface of the exit plane on the OME S/N 116 TCA. The nick is below the fuel manifold, therefore there is not fuel passage behind the nick. MR was to wet sand with 800 grit paper to remove the raised metal only and to accept the nick for unrestricted use. The pre-polishing dimensions were H = 0.022", W = 0.0476", D = 0.0053" in base on mold impression.

<b>OMS/RCS MR SUMMARY</b>	Presenter:
	Organization/Date: Orbiter/02-14-02

<u>PR Number</u>	<u>Part Name</u>	<u>Part Number</u>	<u>Serial</u>	<u>Date</u>
<b>RP05-15-0406</b>	<b>OMS Engine</b>	<b>1186074-1</b>	<b>114</b>	<b>09/21/00</b>
OME oxidizer inlet line plug had excessive gap at nominal installation torque. Boeing HB analysis allowed an increase in max torque to 230 in-lbs to achieve the correct gap.				
<b>RP05-15-0407</b>	<b>OMS Engine</b>	<b>1186074-1</b>	<b>114</b>	<b>09/22/00</b>
OME Pc port plug had an excessive gap at nominal installation torque. Boeing HB analysis allowed increase of the max torque to 230 in-lbs to achieve the correct gap.				
<b>RP05-15-0408</b>	<b>OMS Engine</b>	<b>1186155-01</b>	<b>114</b>	<b>09/22/00</b>
OME Pc transducer adapter to chamber had an excessive gap at nominal installation torque. Boeing HB analysis allowed an increase of the max torque to 230 in-lbs to achieve the correct gap.				
<b>RP05-15-0409</b>	<b>OMS Engine</b>	<b>1186074-1</b>	<b>114</b>	<b>09/21/00</b>
OME fuel ball valve plug had excessive gap at nominal installation torque. Boeing HB analysis allowed increase of max torque to 230 in-lbs to achieve the correct gap.				